BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

Vol. 53] 1956 [No. 2

THE DIAGNOSIS & TREATMENT OF ANAEMIA IN THE TROPICS

H. C. Trowell, O.B.E., M.D., F.R.C.P.

Senior Specialist, Mulago Hospital, Uganda Medical Department

Table of Contents

	Page
Introduction	121
Classification of the Common Anaemias of the Tropics ...	122
Iron Deficiency Anaemia	125
Nutritional Megaloblastic Anaemia	126
Undernutrition Anaemia	127
" Protein Malnutrition " Anaemia	127
Malarial Anaemia	128
Hookworm Anaemia	129
Chronic Disease of the Liver and Spleen	131
Recent Advances in Therapy	132

This article discusses in a practical manner the diagnosis and treatment of the various *common* anaemias encountered in tropical regions and reflects experience gained in some 26 years of work in East Africa. The approach is that of a physician engaged in treating cases; no attempt will be made to review the literature, although a few references are mentioned. The techniques employed are always those which are simple and reasonably reliable; only brief mention will be made of more refined methods of investigation and research.

There are many classifications of anaemia: 30 years ago they were divided into the primary anaemias (pernicious anaemia and chlorosis) and secondary anaemias (due to malaria, hookworms, tuberculosis, etc.). This is still the approach of some textbooks of tropical medicine, but is

too limited a statement of aetiology, which is often complex. More recently in America and Europe the anaemias have been divided into: (1) the dyshaemopoietic deficiency anaemias, (2) those due to excessive haemorrhage or haemolysis, (3) those due to defective formation of blood —the hypoplastic anaemias. This classification frequently breaks down in the tropics and a combination of the two approaches—the old and the new—is desirable.

Classification of the Common Anaemias of the Tropics

I. *Anaemias due to Deficiency and Dietary Factors*
   1. Iron (a) excessive losses (b) low intakes and absorption
   2. Megaloblastic anaemias (a) pregnancy and nutritional (b) sprue (c) pernicious anaemia
   3. Undernutrition (mainly calorie deficiency)
   4. "Protein malnutrition" (a) low intakes (b) excessive losses
   5. Other factors: vitamin C, thyroid, etc.

II. *Anaemias due to Infective Factors*
   1. Excessive destruction of blood
      (a) haemolysis of malaria and blackwater fever
      (b) haemorrhage of hookworms and schistosomiasis
   2. Chronic infections
      tuberculosis, kala azar, trypanosomiasis, brucellosis, amoebiasis, chronic sepsis, etc.

III. *Anaemias due to Diseases of Parenchymatous Organs Affecting Metabolism*
   Chronic diseases of liver, bone-marrow, reticulo-endothelial system and spleen, kidney, endocrine organs, neoplasms, etc.

IV. *Anaemias due to Other Uncommon Causes*
   1. Familial haemolytic anaemias, sickle cell, Cooley's anaemia, etc.
   2. Other rare acquired varieties as seen in all areas of the world: *e.g.*, anaemias due to drugs, bone-marrow disease, leukaemia, purpura, etc.

In other words a case of anaemia in the tropics is examined very largely to detect (I) deficiencies, (II) infections, (III) visceral disease. Details of the age, sex, diet, occupation, wages and social class afford the clue to the deficiencies present; a knowledge of the ecology of the patient, and a *clinical examination*, combined with special examination of the blood, stool or other specimens, will decide which infections are present. These are not necessarily only tropical infections. Long before one starts to ask for a blood count one has most important suggestions concerning aetiology and treatment, indeed the blood count performed by itself may be most misleading.

The clinical examination should also assess the *severity of the anaemia*,

bearing in mind that anaemia cannot be detected by ordinary clinical examinations until the haemoglobin is less than 50 per cent. (about 7 gm. Hb per 100 ml.). Mild degrees of anaemia are always missed clinically; they should always be suspected when the patient complains of palpitations or headaches, or tires easily. All recent work in Asia and Africa stresses the fact that normal men in all parts of the world should have a haemoglobin value of 14–16 gm. per 100 ml., and women 12–14 gm. Children should never have below 11 gm. even when the lowest physiological levels occur, during the first year of life.

If, however, *mild anaemia* is discovered, it is best to search for any other disease present in the body and to regard this as the probable " cause ". While this disease is being treated, possibly with extra iron, protein or fresh vegetables, the haemoglobin may improve; in that case one or all the alleged " causes " were operating. Far too many persons of all ages in tropical regions, however, appear to have low haemoglobin values influenced little by treatment. This is discussed again at the end of this article (*Chronic Disease of the Liver and Spleen*).

It may then be wondered if this haemoglobin reading is correct, or whether a lowered haemoglobin is not normal to certain individuals or social groups. It should also be considered whether the haemoglobinometer is correct. It is best to buy and use a haemoglobinometer which has been recently standardized; if in doubt about the instrument (and the standard slowly deteriorates) it is good to check it against some healthy well-fed young men and thus obtain normal figures.

At the other end of the scale there will be found causes of *severe anaemia* threatening life; these almost all become severe because of one or possibly two principal factors or causes, and every effort should be made to detect them. A severe anaemia can be presumed by noting the colour of finger nails, conjunctivae, lips and hard palate, since anaemia may be masked in those having a dark skin. A careful record of the heart rate and breathing will indicate if a *blood transfusion* must be undertaken as an emergency measure. In deciding whether this is necessary one should bear in mind whether the haemoglobin is falling very rapidly, as in blackwater fever and severe attacks of malignant tertian malaria, or is almost stationary, as in hookworm anaemia. One can say, as a rough rule, that an emergency transfusion is required in blackwater fever if the Hb falls to 50 per cent. and in *P. falciparum* malaria if the Hb falls to 40 per cent. (and there is still a high parasitaemia); in these conditions blood transfusions, if given slowly, are usually well tolerated, for there are few signs of chronic circulatory failure—little increase, if any, in blood volume, or fatty myocardial changes. In chronic hookworm anaemia a low but stationary haemoglobin of 15–20 per cent. is compatible with life, and the patient may not require blood transfusion unless the count continues to deteriorate. Indeed, blood transfusions are very poorly tolerated, as the myocardium is fatty, the cardiac output and blood volume are already much increased,

TABLE I

TYPICAL BLOOD CHANGES IN COMMON TROPICAL ANAEMIAS

	1	2	3	4	5	6	7	8
DEFICIENCIES	Iron	Megaloblastic	Under-nutrition	Protein				
INFECTIONS					Malaria	Hookworms Schistosomes		Other infections (TB, kala azar, etc.)
VISCERAL DISEASE							Hepatic & splenic	
FREQUENCY	Frequent	Uncommon	Frequent	Frequent in certain areas	Frequent in certain areas	Frequent in certain areas		Variable
ASSOCIATIONS	With 6 & 4	With or without pregnancy	With 8	With 2 & 6 and pregnancy	With 4 & 7	With 1 & 4	With 4	With 1 & 3
COLOUR INDEX	0·3–0·7	1·0–1·3	0·9–1·1	0·8–1·2	0·9–1·1	0·5–1·0	0·8–1·2	0·9–1·1
Hb %	10 upwards	10 upwards	80–90	50–70	30 upwards	10 upwards	60–80	50–70
RBC in smear	Hypochromic microcytes	Increased anisocytosis; macrocytes	Normal	Flat, thin, disc-like cells; others vacuolated	Parasites	Mixture of 1 & 4	Normal or as in 4	Normal
POLYCHROMASIA	Nil	Increased	Nil	Increased	Much increased	Increased	Slight increase	Nil
RETICULOCYTES %	0–1	1–5	0–2	3–8	2–15	5–10	3–12	0–2
RET. RESPONSE	Iron	Folic acid ? B12 ? liver	Nil	Nil	Specific therapy	Iron	Nil	Sometimes to specific therapy
MCV (cμ)	40–80	90–140	80–90	85–110	80–100	50–100	85–110	80–90
MCHC (%)	15–25	25–35	30–35	25–35	30–35	20–25	25–35	30–35
MD (μ)	4–6	6–12	6–8	6–10	6–9	5–9	6–10	6–8

but the serum proteins are depleted; if several pints of normal blood are added there is often fatal circulatory collapse and pulmonary oedema.

In any case of transfusion the object is not to *cure* the anaemia—this represents an almost impossible addition of blood—but to *remove the danger of anoxic death.* In an adult 1–2 pints are sufficient. In children below 2 years (12 kgm. body weight) not more than half a pint, given slowly, is permissible; even this represents an addition of 25 per cent. to the blood volume. I have seen several deaths from over-transfusing young children with a pint of blood, and similar fatalities in adults who have chronic anaemic heart failure. Large transfusions are given to children very slowly.

It should be clearly borne in mind that unless the cause of the anaemia is diagnosed before a blood transfusion is given, it will be almost impossible to discover it after the addition of much normal blood. A blood count will then reveal the normal cells of the blood transfusion—normocytic orthochromic cells. Even if a full blood examination cannot be carried out prior to the transfusion, it should at least be possible to estimate the haemoglobin and to prepare thin and thick blood films. It is possible to diagnose the cause of most of the common tropical anaemias from a consideration of these films, and from a response to treatment. Table I shows typical findings in eight of the commonest anaemias. I find that by inserting a glass diaphragm, ruled as a micrometer gauge, within the 16 × ocular of my microscope, I am able quickly to measure approximately the mean diameter (MD) of the red cells. The ocular is calibrated against a micrometer slide, but if this is not obtainable, one can for comparison examine normal blood in which cells vary little in size and average slightly over 7 μ. When this ocular is fitted with the micrometer gauge, I can state if there are many macrocytes ($> 8\ \mu$) or microcytes ($< 6\ \mu$) present. This I find an enormous help, and I can envisage the Price-Jones curve which would be produced by measuring accurately 1,000 red blood cells in respect of the mean diameter.

Iron Deficiency Anaemia

Iron deficiency anaemia is diagnosed upon finding much hypochromia in the stained field. The cells are " pessary " cells, mere rims of haemoglobin; they are mostly microcytes (MD $< 6\ \mu$). The only common cells which can be confused are thin, broad, slightly hypochromic but macrocytic cells of " protein malnutrition " (see later) or the ballooned cells of Cooley's anaemia. Confirmation of iron deficiency is found quite easily in the low colour index (CI) and low reticulocyte count. The erythrocyte count is often surprisingly high. It is seldom necessary to estimate and obtain low values for mean corpuscular haemoglobin concentration (MCHC) or mean corpuscular volume (MCV) or to examine the marrow biopsy smears.

Iron deficiency in adults is usually due to abnormal losses of iron from the body. Males lose about 1 mgm. of iron per day in skin cells, sweat

and urine; iron balance is achieved by absorbing about one-tenth of iron normally taken in the diet (12 mgm.). Menstruation losses (14–28 mgm.) and those of pregnancy and lactation (1,400 mgm.) set the requirements of women much higher. Pathological losses occur in all forms of haemorrhage and therefore occur in hookworms infection and in schistosomiasis.

The first step in the treatment of iron deficiency anaemia is to check, if possible, any pathological losses. In women serious losses may be physiological: repeated pregnancies and lactations. There may also be poor absorption of iron, especially in those with achlorhydria.

The microcytic hypochromic anaemia of iron deficiency responds well to iron therapy, which should produce a rise of Hb at least 1 per cent. per day, or 0·5 gm. per week. Many patients tolerate tablets of ferrous sulphate well; those having abdominal discomfort should take the less irritant ferrous gluconate tablets. A few cases resist oral therapy, even when vitamin C is given at the same time to aid absorption. Intramuscular iron (Imferon *) should be given in these cases and also the severe cases of iron deficiency which occur in hookworm disease, especially if death is threatened by anoxic heart failure. One ampoule (250 mgm. of iron) may be given on alternate days to adults. It is important not to exceed the total maximal requirements. I remember this figure best by bearing in mind that adult Africans weighing 50 kgm. have about 4 gm. of iron in the body; if they have a haemoglobin value of, say, only 25 per cent. the total deficit of iron is about 3·0 gm. The total *maximal* dose is therefore 12 ampoules (3 gm.). In practice I give about 1 gm. (as 4 separate injections on alternate days) as an emergency treatment, followed by oral preparations. The reticulocyte crisis and rise of the Hb are considerably more rapid after intramuscular iron, and this has entirely superseded intravenous iron.

Nutritional Megaloblastic Anaemia (Foy, Kondi and Hargreaves, 1952; Das Gupta, Chatterjea and Basu, 1953)

In its classical form this is an uncommon anaemia; it is largely, but not entirely, limited to the later stages of pregnancy and is commoner when poor, monotonous rice and maize diets are taken. The precise cause is unknown and it occurs in only a few of the pregnant women—others may take the same diet but remain healthy; it may also occur in males. It may be suspected if the blood film shows well stained red cells, with increased anisocytosis, and some macrocytes (MD $> 8\ \mu$); scanty nucleated red blood cells are often present. CI is usually but not always high, MCV may be normocytic but is usually decidedly macrocytic. MCHC is variable—25–35 per cent. The red cell count is often extremely low. The only certain method of examination is the detection of a megaloblastic bone-marrow, but this may be a matter for the expert. Fever is often present and splenomegaly may be gross. Free HCl is

* Imferon (Bengers) is a neutral isotonic solution of an iron-dextran complex; 1 ml. contains the equivalent of 50 mgm. of elemental iron.

usually present in the gastric juice obtained after an injection of histamine; it would be absent in pernicious anaemia (which is very rare in Africans or Asians). Other causes of a macrocytic megaloblastic anaemia, such as sprue, may require consideration in differential diagnosis; the common mistake, however, is to confuse nutritional megaloblastic anaemia with that of "protein malnutrition"; both of these are often, but not always, macrocytic.

Treatment is by folic acid, 10–15 mgm. daily; this is usually slowly curative. Injections of vitamin B12 are sometimes effective, as are injections of penicillin; marmite and liver extracts usually have little action, but very large doses, especially of crude liver extracts, occasionally seem to help. Some cases also appear to need iron and extra protein. Once they are cured and the diet altered, no maintenance treatment is needed—another point of distinction from pernicious anaemia. Subacute combined degeneration of the cord never occurs. Septic complications may impede recovery; certain cases do not recover until pregnancy terminates, often prematurely, as a stillbirth.

Undernutrition Anaemia (Keys, Brožek, Henschel, Mickelsen and Taylor, 1950)

This occurs when a balanced diet is offered, but only small amounts of food are taken, for a variety of reasons. Mild normocytic orthochromic anaemia occurs. Cachexia and calorie deficiency are features of many tropical infections and contribute to the anaemia. Calorie deficiency anaemia, like protein malnutrition anaemia, only responds very slowly; many months pass before the blood count becomes normal.

"Protein Malnutrition" Anaemia (Altmann and Murray, 1948; Adams, 1954; Woodruff, 1955; Trowell, Davies and Dean, 1954)

Dietary protein malnutrition is apparently the sole cause of anaemia accompanying severe and mild forms of uncomplicated kwashiorkor in early childhood. The disease is commonest at that age largely because the requirement of protein is very high in the early years. After that age the requirement drops and the diet is usually adequate, save when the requirement rises during lactation or the last trimester of pregnancy; this may be called adult kwashiorkor or protein malnutrition. At all ages this variety of anaemia is seldom severe, unless an intercurrent infection (especially hookworm infection or malaria) is also present; but at times severe anaemia may be found in the absence of any other disease. This is especially common during pregnancy and also in infancy; in these cases the severity of the anaemia (in the absence of infection) bears little relationship to the severity of the protein malnutrition.

Losses of protein and disturbances of protein metabolism occur in all cases of hookworm disease (most papers suggest a loss of 0·5 ml. or more of blood per day to a single worm), in liver disease, and certain diseases of the spleen (notably those affecting the reticulo-endothelial cells, *e.g.*,

kala azar), so that an element of "protein malnutrition" enters into many of these anaemias, and they may respond poorly to treatment.

The blood film reveals broad, flat disk-like red cells, others are vacuolated and slightly macrocytic in terms of diameter, but are often normocytic in terms of corpuscular volume; this reflects the broad, thin cells characteristic of this anaemia. Some cells are so thin that they contain vacuoles, or bridges of cytoplasm span empty areas in the cell. These cells appear hypochromic, as if iron deficiency might also be present. They resemble very much the hypochromic cells of pure iron deficiency, but those of "protein malnutrition" are often normocytic or macrocytic cells, whereas those of pure iron deficiency are usually microcytic. Other cells are frankly target cells. There is often a slight increase of polychromasia, even before treatment, and reticulocytes vary from 3 to 8 per cent. The CI is about unity, MCV is often slightly raised, MD is definitely raised, MCHC may be slightly decreased (25–33 per cent.). The red cell count is often surprisingly low. This anaemia, only recently recognized, may reflect liver damage or mechanisms at present poorly understood. In my experience it responds only very slowly to many months of high protein diet; in many cases the anaemia is so stationary as to raise doubts about its aetiology or mechanisms. The bone-marrow is often macro-normoblastic, never as megaloblastic as in pernicious anaemia, but a tendency towards "intermediate megaloblasts" (Dacie and White, 1949), may occur (Adams, 1954).

Many other signs of "protein malnutrition" are usually present: severe oedema, low serum albumin, increased globulins, hypocytoplasmic or a fatty and fibrosed liver, pancreatic atrophy and loose stools of undigested food, straight depigmented hair, and various dermatological changes.

Treatment is always difficult and prolonged. Children require skim milk; at first this should be prepared at a strength of 5 per cent. (1 oz. of the powder in 1 pint) and then after a few days the strength is increased slowly by stages to 10 per cent. (normal strength). In infants diarrhoea seldom occurs if the daily intake is restricted to 30 oz.; if more is taken or too strong mixtures are given at first, diarrhoea will occur. Severe cases may require a mixture of equal parts of milk protein (Casilan) and skim-milk powder. After a week or two of this treatment ordinary diet may be slowly added. Adults tolerate dietary changes more easily: 6 oz. skim-milk powder, 1 oz. sugar and $\frac{1}{8}$ oz. of cocoa or flavouring agent are stirred into a thick gruel and given slowly as a single drink. It contains 120 gm. of protein and 1,000 calories and usually costs under one shilling per day. Adults tolerate ordinary diet from the beginning. Megaloblastic anaemia is treated with folic acid.

Malarial Anaemia (Maegraith, 1948; Raper, 1954)

Nothing appears more simple than to make a diagnosis of malarial anaemia: parasites, polychromasia and malarial pigment in the monocytes

can usually all be found in the thick blood smear; much experience and skill, however, are required in interpretation.

If malaria is causing severe anaemia then either an intense parasitaemia must have acted for several days or a moderate parasitaemia for many days. Parasites rapidly disappear in all blood films within 24–72 hours after anti-malarial therapy; if the case is seen first at this stage diagnosis may be difficult, unless malarial pigment can be detected in the monocytes, the number of which may be increased; a history of recent fever and the presence of splenomegaly may also help, but are not conclusive. Subsequently there is a high reticulocyte crisis 5–10 days after specific therapy has been instituted, and a very rapid rise of the red cells and haemoglobin to normal. This I see in well fed persons of all races, Europeans, Asians and Africans.

Too often in African infants in whom there is severe anaemia and intense parasitaemia the haematological response to treatment is moderate, poor or negligible; if these patients are subsequently examined they show clinical, biochemical and haematological evidence of " protein malnutrition " or liver dysfunction or both. This element in the anaemia only responds very slowly to many months of excellent feeding.

In all cases of severe *Plasmodium falciparum* anaemia blood transfusion should be given if the haemoglobin is below 40 per cent.; it falls very rapidly and fatal anoxia may occur. Severe malarial anaemia is a very rare phenomenon in an adult, who is either immune, or if non-immune, usually reports quickly for treatment of the severe attacks.

Increasingly in the treatment of malaria we are relying on chloroquine. Most African infants recover after a daily (single) dose of $\frac{1}{2}$–1 tablet (*i.e.*, 75–100 mgm. chloroquine base), given for 2–3 days; only a few require an injection. Adults need a proportionally larger dose. I have come to regard mepacrine as a very dangerous drug, if administered by injection. It is rapidly absorbed and high blood levels 15–30 minutes later may produce convulsions, coma and permanent damage to the brain. At one time we were confusing this with cerebral malaria. Mepacrine tablets in moderate dosage by mouth are permissible in partially immune adults, and are a cheap form of treatment. A daily dose of 300 mgm. should never be exceeded or the encephalopathy may produce psychosis; those more seriously ill should receive chloroquine or an allied preparation. Quinine is very effective, it is not so rapid in its action as chloroquine, and it is not stored in the tissues; if it is given intramuscularly, an abscess is apt to form at the site of the injection.

Hookworm Anaemia (Lehmann, 1949; Biggam and Ghaloungui, 1934)

Nothing appears more simple than to diagnose hookworm anaemia: the haemoglobin is low, ova are present in the stool, no other cause of anaemia is found! In practice one should diagnose hookworm anaemia only when the patient is discharged cured, or almost cured. Far too

often further clinical examination reveals tuberculosis, chronic nephritis, a urinary infection, cirrhosis or some other condition in addition to hookworms and anaemia.

A tentative diagnosis, however, is suggested if hookworm ova are plentiful and the occult blood test in the stool is *strongly* positive. The latter is a very reliable test; meat and vegetables in the diet will usually allow the benzidine test to remain negative, though diet occasionally causes a weak positive, but a strong reaction always indicates the loss of many ml. of blood each day. Concentration techniques on the stool are a mixed blessing; they detect a very light infection, but if hookworms are causing severe anaemia a smear of the faeces in saline discloses many ova. In these parts of Africa, where *Necator americanus* is responsible for four-fifths, and *Ancylostoma duodenale* for about one-fifth, of the infections, stools obtained for 48 hours after an anthelmintic from a severely anaemic African adult contains 500–2,000 worms. Experience suggests that about 70–90 per cent. of worms are removed by 4 ml. of tetrachlorethylene and 1 ml. of oil of chenopodium, followed 2 hours later by a purge. This dose is repeated after 4 days, but not again, for worm counts here suggest that only 2–10 per cent. of worms survive two doses. These cause less harm than further doses of the anthelmintic.

The diagnosis is further confirmed by an examination of the blood film; hypochromia is always severe. Textbooks record that hookworms cause microcytic hypochromic anaemia; this may occur in Asia and also in Africa, but a large proportion of my patients on admission have normocytic and a few have macrocytic anaemia; all of them are severely hypochromic. The blood film will therefore show anisocytosis: macrocytes, normocytes (6–8 μ MD) and microcytes being all present. Polychromasia is also present, and the reticulocyte count is usually 5–10 per cent. on admission. Many of the red cells, especially those at the side and the tail of the film, are large, flat, evenly-stained macrocytes, others are target cells, or contain vacuoles, strands and bridges across the centre; these cells probably reflect an element of " protein malnutrition ". Other features of the case also indicate " protein malnutrition ".

Having confirmed the diagnosis one administers iron, preferably 250 mgm. intramuscularly (Imferon) on alternate days, and gives a high protein supplement to the ordinary diet (skim-milk powder 6 oz., sugar 1 oz., cocoa $\frac{1}{2}$ oz. stirred into a thick gruel and given slowly). There is a very quick response to these two measures in most, but not all, cases of hookworm disease, unless some other infection or complication occurs. If progress is good for 2 weeks and much protein deficiency has been corrected, it is safe to administer two full doses of the anthelmintic, as described above. If this lightening of the worm load is delayed too long, the haemoglobin becomes stationary after its initial rise, it usually, but not always, improves once more after the anthelmintics have been administered. Patients may then be discharged; if intramuscular injections of iron have been given, the iron deficit of 1–3 gm. has probably

been largely corrected and no subsequent treatment is required; if not, iron must be given by mouth. The patient, however, may fail to take it. Intramuscular injections of iron usually shorten the period of stay in hospital to 2–4 weeks, even in the most severe cases. Many weeks or months of high protein feeding are needed to correct the protein deficiency.

Chronic Disease of the Liver and Spleen (Trowell, Davies and Dean, 1954; Larsen, 1948; Woodruff, 1955)

Severe disease of any parenchymatous organ, which plays a major rôle in metabolism, causes anaemia. This is true of the liver, reticulo-endothelial system and spleen, bone-marrow, endocrine glands and kidneys.

For a large variety of reasons, chiefly chronic "protein malnutrition" and chronic parasitic infections, many chronic diseases of the liver and spleen are seen in patients in the tropics, but it is difficult to classify most of them as classical cases of "Laënnec cirrhosis" or "Banti splenomegaly" or "schistosomal splenomegaly". In my opinion, malnutrition plays a major rôle in many of these cases; well fed persons stand up well to parasitic and other insults.

A large proportion of persons in the tropics show evidence of chronic hepatic disease; the organ is palpable and firm in life, its weight may be abnormally high or low at autopsy, biopsy or autopsy specimens show disturbances of structure; in life the serum protein values and other liver function tests, including the serum bilirubin, are often abnormal. So is the blood count, which is abnormal in a peculiar manner in all varieties of liver disease (Larsen, 1948).

Certain cases of splenomegaly which are very common in adults in many tropical countries show features of liver damage; in others in whom the spleen is very large, little or nothing may appear wrong with the liver. These cases of gross splenogemaly are seldom explained as being due entirely to any tropical infection, not even that of malaria or schistosomiasis. The detection of an occasional ovum or of malaria parasite does not explain these cases. Portal hypertension, due to chronic hepatitis, will explain more than was formerly thought; but other patients are seen in whom this is excluded even at laparotomy. These spleens mostly show reticulo-endothelial hyperplasia.

Provisionally I put all these cases into two groups; after many years of thought I cannot make rigid subdivisions. Tentatively I classify them into:—

(A) Chronic hepatitis, with or without portal hypertension, and with or without splenomegaly.

(B) Chronic splenomegaly, unexplained by (A) or by known infections or blood diseases.

The blood picture in both of these conditions is often very similar: a mild or moderate anaemia, reticulocytes 3–12 per cent. (some almost appear frankly haemolytic, with increased serum bilirubin (Foy, Kondi

and Hargreaves, 1952), MCV 85–110 cμ., MCHC 25–33 per cent., leucopenia, especially neutropenia, slight thrombocytopenia and other features of hypersplenism (Dameshek and Estren, 1947) and liver disease.

No treatment either of supposed infection or of supposed deficiency influences the blood count in these cases. This group of diseases (which at present contains cases which subsequent work will identify and then separate off) does not have the sharp edges of a "clinical entity", such as pernicious anaemia; all grades and transitions are seen. It appears to be more in the nature of a complex response of the spleen, liver and haematopoietic tissues. I tentatively suggest that many of these cases reflect chronic protein malnutrition or parasitic disease or both. Splenectomy may be attempted for persistent splenic pain, but the risk is high, about 10–20 per cent., even in the best hands as many of the adhesions are very vascular. There have been few reports to indicate whether splenectomy influences the haemolytic anaemia and blood count. Apparently healthy Africans have abnormal blood counts: those with the lowest Hb often have slight macrocytosis (Holmes and Gee, 1951). This is the "base line" of many Africans; hepatic, parasitic and deficiency anaemia is grafted on to this picture, to which the blood reverts, at suboptimal levels, when parasites have been destroyed and deficiencies corrected.

Recent Advances in Therapy

In blackwater fever the use of cortisone and allied products can no longer be considered totally empirical. I have noted that clinical improvement occurred in two severe cases as soon as Meticorten 100 mgm. daily was started; my colleague, Dr. P. W. Hutton (personal communication, 1955) has noted that improvement coincided in two cases with the administration of corticotrophin. Treatment should continue for several days and be tapered off slowly. The Third Report to the Medical Research Council (1955) stresses the value of cortisone in many varieties of acquired haemolytic anaemia.

The use of potent intramuscular injections of iron has brought into sharper focus those anaemias which respond and those which do not. In this hospital almost all cases of hookworm anaemia in adults have responded well, in children most have responded well, but others have not and have deteriorated for no apparent reason. Cases of severe anaemia in pregnancy have often responded well. Likewise some cases of kwashiorkor in children have responded to this form of iron therapy, even when no hookworms have been present; but many have not, for no apparent reason. Whether any factor in protein, in the vitamins, or in liver will operate in these stationary or refractory cases remains to be seen.

In conclusion it should be clearly stated that an attempt has been made here to write a review of the present status of knowledge concerning the common anaemias of the tropics. That which is set forth is

fairly generally accepted; probably the exact status of "protein malnutrition" anaemia has yet to be evaluated. No space has been devoted to sickle-cell anaemia, a common anaemia among young children in these parts, for at present there is no treatment apart from frequently repeated blood transfusions. I have endeavoured *not* to set forth any personal interpretation, but this should not be construed as asserting that I now consider that two (or more) deficiencies never co-exist, a position set forth originally by me (Trowell, 1943–44). In my opinion these may occasionally occur (see Table I), but whether both factors produced the original anaemia, or are merely needed to complete cure, is a matter on which I would like to suspend judgement. Much, of course, will depend on the diet offered during treatment, for this may supply enough of other factors, the deficiency of which is marginal. Diet by itself is unlikely to supply enough iron, if this is required in large amounts to complete cure.

Ackowledgment

Thanks are due to the D.M.S., Uganda, for permission to publish this article.

References

Adams, E. B. (1954), *Brit. Med. J.*, Mar. 6, 537. [*Trop. Dis. Bull.*, 1954, 970.]

Altmann, A. & Murray, J. F. (1948), *South African J. Med. Sci.*, v. 13, 91. [*Trop. Dis. Bull.*, 1949, 159.]

Biggam, A. G. & Ghaliougui, P. (1934), *Lancet*, Aug. 11, 299. [*Trop. Dis. Bull.*, 1934, 798.]

Dacie, J. V. & White, J. C. (1949), *J. Clin. Path.*, v. 2, 1. [*Trop. Dis. Bull.*, 1949, (489).]

Dameshek, W. & Estren, S. (1947), *The spleen & hypersplenism*, New York.

Das Gupta, C. R., Chatterjea, J. B. & Basu, P. (1953), *Brit. Med. J.*, Sept. 19, 645. [*Trop. Dis. Bull.*, 1954, 209.]

Foy, H., Kondi, A. & Hargreaves, A. (1952), *Trans. Roy. Soc. Trop. Med. & Hyg.*, v. 46, 327. [*Trop. Dis. Bull.*, 1952, 1146.]

Holmes, E. G. & Gee, F. L., with Kyobe, J. (1951), *East African Med. J.*, v. 28, 297. [*Trop. Dis. Bull.*, 1952, 174.]

Keys, A., Brožek, J., Henschel, A., Mickelsen, O. & Taylor, H. L., with Simonson, E., Skinner, A. S & Wells, S. M. (1950), *The Biology of Human Starvation*, p. 248. Minneapolis: University of Minnesota Press. London: Geoffrey Cumberlege, Oxford University Press. [*Trop. Dis. Bull.*, 1951, 767.]

Larsen, G. (1948), *Acta Med. Scandinavica*, Suppl. 220.

Lehmann, H. (1949), *Lancet*, Jan. 15, 90. [*Trop. Dis. Bull.*, 1949, 664.]

Maegraith, B. (1948), *Pathological Processes in Malaria and Blackwater Fever*, p. 75. Oxford: Blackwell Scientific Publications, Ltd. [*Trop. Dis. Bull.*, 1949, 180.]

Medical Research Council: Panel on the Haematological Applications of A.C.T.H. and Cortisone. Third Report. (1955), *Brit. Med. J.*, Aug. 20, 455.

Raper, A. B. (1954), *East African Med. J.*, v. 31, 443. [*Trop. Dis. Bull.*, 1955, 291.]

Trowell, H. C. (1943), *Trans. Roy. Soc. Trop. Med. & Hyg.*, v. 37, 19. [*Trop. Dis. Bull.*, 1943, 938.]

Trowell, H. C., Davies, J. N. P. & Dean, R. F. A. (1954), *Kwashiorkor*, p. 271. London: Edward Arnold, Ltd. [*Trop. Dis. Bull.*, 1955, 496.]

Woodruff, A. W. (1955), *Brit. Med. J.*, May 28, 1297. [*Trop. Dis. Bull.*, 1955, 818.]

SUMMARY OF RECENT ABSTRACTS *

II. YELLOW FEVER †

General: Epidemiology

At the 1953 WHO Seminar on Yellow Fever, Kampala (p. 143), the situation in parts of Africa, Brazil, Colombia and Central America was discussed by several participants. It seems to be agreed that for control of urban yellow fever, measures against *Aëdes aegypti* are needed, and for rural areas extensive immunization. Cases of meningo-encephalitis after vaccination were discussed [see below]. For the diagnosis of yellow fever the point was made that isolation of the virus circulating in the blood during the early part of the disease is a valuable procedure; the specificity of the histological lesions produced in the liver is doubted, and it is noted that opinions have differed considerably as to the interpretation of the same specimen. Papers on transmission indicated that in Uganda *Taeniorhynchus* species cannot transmit the virus in nature, but in Central America the suggestion has been made that the rôle of *Phlebotomus* as a possible vector should again be investigated.

In the WHO Symposium on Yellow Fever in Africa (p. 146), which includes a detailed statement on incidence and the geographical distribution of positive mouse-protection tests, the point is made that in Africa it is mainly a sylvan or rural disease, transmitted by non-domestic mosquitoes such as *Aëdes simpsoni* and *Aëdes africanus*. Papers on the distribution of immunity in Kenya and on vaccination in French West Africa are also included.

---

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1955, v. 52. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on yellow fever in this series, see the February issues of the *Tropical Diseases Bulletin* each year since 1939.

Cambournac *et al.* (p. 1073) report only a few positive protection tests in 1,549 sera (mostly from children) collected in Angola. Some of the positive results may have been the result of former vaccination, but the records of such immunization are incomplete.

Discussing the expected progress of the wave of yellow fever which since 1948 has swept across Central America (where the disease had not been seen since 1924) Elton (p. 1075) notes that there has usually been a period of quiescence during the dry season or winter months. The indications are that the wave will soon spread to northern Guatemala, British Honduras and as far as the mountainous regions of the State of Tamaulipas, where it will probably end.

The first case of yellow fever to be confirmed in Trinidad since 1914 is reported by Anderson *et al.* (p. 892), and in a note on the recent outbreak of yellow fever there Stuart (p. 1184; note on the paper by Anderson and Downs) reports that during 1954 15 human cases were recorded; in 2 of them there was no history of direct association with forests, and they occurred in areas infested with *Aëdes aegypti*.

Animal Reservoirs

In the Report for 1953 of the Pasteur Institute, French West Africa (p. 943) an account is given of work done on jungle yellow fever. The bush-baby (*Galago senegalensis*) is abundant in the woodland area near Boulel, and may be the reservoir; *Aëdes simpsoni* is prevalent and is probably the vector. Vaccination by scarification with the neurotropic Dakar vaccine has been extensively practised and is probably responsible for the great reduction in the incidence of yellow fever in recent years.

The mechanism of maintenance of the cycle in the southern Sudan is not clear [see also Lumsden, below]. Neutralization tests on human sera were positive in 8·5 per cent. of children and 22·9 per cent. of adults tested by Taylor *et al.* (p. 1073). Tests were positive in 39 of 54 monkeys and baboons but only 1 of 56 galagos was positive, and these animals probably play no part in the cycle. It seems likely that the cycle may be maintained in man, monkey and baboon by mosquitoes that attack all three. In comment Dick argues that the possibility that ticks might be involved has not been fully investigated.

Anderson and Downs (p. 1184) found typical yellow fever lesions in the livers of 7 naturally infected howler monkeys in Trinidad, and isolated yellow fever virus from them. Collias and Southwick (p. 36) report a study of a community of howler monkeys on an island in the Gatun Lake, Panama Canal. The monkey population has apparently diminished since it was first studied in 1932–33, possibly as a result of the wave of yellow fever which passed through Panama recently.

Transmission

Lewis (p. 1150) has written a note on the *Aëdes* mosquitoes of the Sudan, which is relevant to the yellow fever situation.

Lumsden (p. 893) discusses the yellow fever cycle in the Uganda rain forest, where transmission from monkey to monkey by the perennial *Aëdes africanus* is easy to understand. But in dry areas where adult mosquitoes become very rare in the long dry season the cycle is difficult to understand. The virus circulates for only a short time in the mammalian hosts (probably the galago), and is present in infected mosquitoes for the remainder of life, but no evidence has been found that the virus can be passed in mosquitoes by the ovaries to the next generation. The question where the virus exists in the dry season is not yet answered.

In Uganda Gillett (p. 1074) has observed that *Aëdes simpsoni* varies in its biting habits in relation to man; in some areas (for instance Bwamba, where cattle are absent) it is anthropophilic, in others (for instance where cattle are kept) it does not bite man. The exact cause of the difference in biting habits is obscure and there may be anthropophilic and non-anthropophilic races. This selective habit may explain the absence of yellow fever in some areas apparently suitable for transmission.

The mosquito which has been called *Aëdes leucocelaenus*, held to be one of the two main vectors of jungle yellow fever, has now been shown to include subspecies which Galindo *et al.* (p. 35) describe as *A. l. leucocelaenus* (S. Brazil and Argentina), and *A. l. clarki* (Panama and Costa Rica). Other related species are *A. leucophoebus* n. sp. (Eastern Andes), *A. leucotaeniatus* (Panama and Costa Rica) and another to be described separately from Colombia.

Trapido *et al.* (p. 1075) report a survey of forest mosquitoes in the Panama isthmus area; collections were made on the ground and in the forest canopy. Of the genus *Haemagogus*, *H. equinus* was the most common, *H. spegazzinii falco*, a known vector of yellow fever in Colombia, was not common, nor was *Aëdes leucocelaenus clarki*, also a known vector. The findings do not provide a simple explanation of the long-continued absence of sylvan yellow fever from west of the canal before 1950. The point is made that the probable vectors are much more prevalent on the Atlantic than on the Pacific side, and that it was on the Atlantic side that human and monkey fatalities were recorded within recent years. In Costa Rica, however, Galindo and Trapido (p. 1076) found *H. spegazzinii falco* to be relatively abundant. It is usually a forest canopy feeder but in small clearings it may come to ground level and bite man, thus being in dangerous contact with cultivators. Attempts to recover virus from this and other suspected mosquitoes (such as *Sabethes chloropterus*) were not successful.

There is no yellow fever in Malaya, but Reid (p. 760) shows, as a result of a survey, that *Aëdes aegypti* is present in different parts of the country, and that Malaya must therefore be regarded as a "yellow-fever receptive area". Gillet and Ross (p. 760), moreover, show that these mosquitoes are capable of transmitting yellow fever by bite to monkeys under laboratory conditions.

Kershaw *et al.* (p. 584) have studied, under laboratory conditions, the relation between age and the rate of mortality in mosquitoes (including *Aëdes aegypti*) and *Chrysops*, and conclude that mortality increases with age.

Diagnosis: Pathology: Clinical Findings

Porterfield (p. 529) has used a haemagglutination-inhibition test in diagnosis, the antigen being an acetone and ether extract of serum from a monkey infected with the Asibi strain of virus. The results of this test on persons from various parts of Nigeria agreed very well with the results of the mouse-protection test in detecting antibodies after natural infection and after vaccination with 17D. The haemagglutination-inhibiting antibody thus demonstrated is different from the complement-fixing antibody, which is normally absent from persons vaccinated with 17D. The haemagglutination-inhibition test is not likely to replace the mouse-protection test, because there is little information on its specificity.

Elton *et al.* (p. 1184) describe the findings in their study of the clinical pathology of yellow fever as they have seen it in Costa Rica. The details should be sought in the original abstract and cannot satisfactorily be summarized further. The authors consider that the primary lesion is hepatitis, and that the most serious secondary disturbance is renal failure.

Trejos and Romero (p. 967), investigating the haemorrhagic manifestations of yellow fever, have found that a low plasma prothrombin level (below 25 per cent. of the normal on the 4th–9th day of disease) carries a bad prognosis. The degree of diminution of the prothrombin level is proportionate to the severity of the liver lesion, and when recovery takes place there is a rapid increase in the prothrombin level, indicating regeneration of the liver which permits metabolism of vitamin K (which was given to the patients in high dosage).

The recent epidemic of yellow fever in Costa Rica was serious, and Romero and Trejos (p. 528) report a case-mortality rate of 37 per cent. in non-vaccinated patients observed by them. They point out the importance of search for malaria parasites in patients with yellow fever, observing that malaria is usually endemic in yellow fever areas. Early diagnosis and treatment of yellow fever are important, and tests should be made for abnormalities of the urine, blood urea, the haemogram and especially the prothrombin time. The most adequate treatment consists of preventing dehydration and supplying vitamins, especially high doses of vitamin K as early as possible. Romero (p. 529) analyses cases of yellow fever in children in Costa Rica, pointing out that although the symptoms were similar to those observed in adults, they were milder, and the case-mortality rate was lower.

Control

Floch and Fauran (p. 761) report that *Aëdes aegypti* and *Anopheles darlingi* have been practically eradicated from French Guiana.

As a test of the efficacy of DDT spray in the control of *Aëdes aegypti* in British Guiana, Giglioli (p. 337) introduced large numbers of larvae and pupae into treated houses. No surviving adults were found, and no breeding foci were created.

Immunization

Cannon and Dewhurst (p. 1185) have prepared a vaccine from a first mouse-brain passage of seed 17D from chick-embryo material, and have used it by scarification in African volunteers; it was as efficient as chick-embryo vaccine given by scarification. A few tests in monkeys indicated that it was safe, there is no reason to suspect that contaminating viruses may be present in the mice, and the fact that it is prepared from seed derived from chick-embryo material is likely to ensure that there is no increase of neurotropism (though in comment Dick suggests that tests should be made in monkeys to ensure that this does not happen).

Encephalitis after vaccination for yellow fever has been reported frequently in the last few years. From August 1952 up to the end of the period covered by the abstracts under review there have been reports of 13 cases in infants vaccinated with strain 17D. This vaccine was standardized in 1942, and is prepared from the first passage in eggs from the seed lots of the original standard batch, and not from virus which has gone through serial passage in eggs. Of these cases 7 occurred in France (WHO Seminar, p. 143; Lartigaut and Couteau, p. 147; Lartigaut and Lartigaut, p. 530), 4 in the United Kingdom (Smith, p. 37; Haas, p. 37; Scott, p. 37; Thomson, p. 968), 1 in Portugal (Freire, p. 763), and 1 in Nigeria after immunization in the United Kingdom (Beet, p. 355). In all cases the onset of encephalitis occurred 2–3 weeks after immunization, and in several there had been no other immunological procedure, though some of the infants had been immunized against smallpox at the same time. Recovery was complete in all cases. The reactions are generally regarded as due to the vaccine, but Thomson (*loc. cit.*) remarks that the exact cause of the encephalitis is not yet known, and Roodyn (p. 762) is not satisfied that all the cases of encephalitis reported after vaccination with 17D are in fact due to that virus, and as a result of a very large experience of using it in London he thinks that the reactions, even if due to the vaccine, are so rare that it should be regarded as safe. Cannon (p. 763) also doubts whether 17D was responsible in some of the cases reported in England, pointing out that similar cases are frequent in infants who have not received any protective inoculation. From his experience of large numbers of vaccinations in Lagos he regards 17D as safe.

A much more severe type of encephalitis was reported by Stones and Macnamara (p. 761) in 83 persons among 42,400 vaccinated by scarification with the French Dakar neurotropic vaccine in Nigeria; there were 32 deaths. The incidence was higher in children than in adults, and the cases occurred 7–23 days after vaccination (median 11·7). Investigation

of 3 fatal cases indicated that the cause was a neurotropic strain of virus, not the naturally occurring viscerotropic strain, and as there was no evidence of any other cause, the authors attribute the disease to the vaccine used.

Cross Immunity

Dinger (p. 148) reports some degree of immunity to injection of neurotropic yellow fever virus in mice which had previously received several injections of dengue virus, but this was not evident if the yellow fever injection was repeated within 24 hours. *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

Misra, B. G. & Dhar, S. K. **Malaria in Tripura State.** *Indian J. Malariology.* 1955, June, v. 9, No. 2, 111–23, 1 map & 1 chart.

Tripura is a small Indian state, 4,116 square miles, with a population of 639,029, south-east of Eastern Pakistan. To the north it abuts on the Cachar District of Assam. Its western and southern borders are formed by the Districts of Sylhet, Tipperah, Noakhali and Chittagong. The Chittagong and Sushai hills lie to the east. High hill ranges separated by numerous valleys run north–south. Agartala is the capital town. Communications are very poor: there is only one all-weather road which connects Agartala with Assam. The hills are inhabited by several tribes, Gonds, Khasias, Nagas and Kukis among them. There is little intercourse between the valley dwellers and the more primitive hill tribes. Houses, except in Agartala, have mostly matting walls and thatched roofs. Rice is the main crop, though some tea, cotton and jute are also grown. Forests provide timber and firewood. The climate is hot and humid all the year except in December and January. The average rainfall is 102 inches.

Malaria is very prevalent. The results of the examination of 2,603 children living in 48 villages in 7 of the 10 subdivisions of the State are tabulated. The overall spleen rate was 57·2 and the parasite rate 20·9 per cent. Villages along the foot-hills in close proximity to streams had spleen rates of from 80 to 100 per cent. *P. falciparum* was the most prevalent species, 61·7 per cent.; *P. vivax* accounted for 36, *P. malariae* 1·5 and mixed infections 0·8 per cent.

Ten species of *Anopheles* were captured—*aconitus*, *annularis*, *barbirostris*, *culicifacies*, *fluviatilis*, *hyrcanus*, *jeyporiensis*, *minimus*, *subpictus* and *vagus*. *A. minimus* was the only species found infected: the anopheline density was relatively low when the collections were made.

At the end of 1953 DDT residual spraying was begun in a few villages near Agartala town. During the current year it was hoped to extend spraying operations to cover the whole state. *Norman White*

South Pacific Commission. Noumea, New Caledonia. **Malaria in the South-West Pacific** [Black, R. H.]. *Technical Paper No. 81.* 1955, Mar., mimeographed pp. iv + 56, 2 maps (1 folding). [Numerous refs.] [2s.]

This review with a lengthy and useful list of references has been written at the invitation of the South Pacific Commission. The following items are discussed: history; geographical distribution of malaria, parasitology, vectors of malaria, malaria in the intermediate host, malaria control.

The geographical distribution of malaria in the south-west Pacific is clearly indicated on a map; why anophelines have not yet spread eastwards beyond 170° east and southwards to New Caledonia and Loyalty Islands is not known. In consequence malaria is absent from Polynesia, although Polynesians living on outlying islands of the Solomon group suffer from malaria. Within the malarious area altitude has an effect on the distribution of vector anophelines but they have been found up to heights of 7,000 feet.

All 4 species of plasmodia occur in the south-west Pacific. On the Australian mainland it is possibly only *P. vivax* which is now endemic but *P. falciparum* has been responsible for epidemics and has been found during surveys in the past. Brief notes are given of the existing knowledge of the morphology of the plasmodia found in this south-west Pacific area.

Two groups of workers added greatly to the knowledge of the *Anopheles* of this area, the Australian group working mainly in Papua and New Guinea and the United States group mainly in the New Hebrides and the Solomons. The conclusions are that the proven natural malaria vectors for the various islands and island groups are as follows: New Guinea—*A. farauti*, *A. punctulatus*, *A. bancrofti bancrofti*, *A. subpictus*; British Solomon Islands—*A. farauti*; New Hebrides—*A. farauti*; Australia—*A. farauti* (North Queensland), *A. amictus hilli* (North Queensland). The malaria rates for the various island territories cannot be accurately assessed, but the approximate populations of island people are as follows: New Guinea 3,100,000, Solomon Islands Protectorate 100,150, New Hebrides 45,000. Some 10 pages are devoted to a review of the literature on the clinical aspects of malaria and its effects

on communities; *e.g.*, despite the widespread occurrence of hookworm the New Guinea nutrition survey of 1947 provided evidence that malaria was a significant factor in the production of anaemia and also appreciably affected the nutritional status of village people. It is quite clear from this chapter that malaria is a major factor affecting the public health in all the islands of this area.

After a brief history of malaria control, information is given on the malaria control programmes in operation at present; this has been obtained from a series of reports by the various administrations to the World Health Organization in connexion with the Second Asian Malaria Conference for the western Pacific and south-east Asia regions. In the territory of Papua and New Guinea about 30,000 people are protected by residual spray, larvicidal, TIFA fog or drug prophylactic measures. In the Mekeo sub-district results of residual spraying appear to have been dramatic, in consequence of which a malaria control organization is being set up and personnel are in process of training. It is thought that complete control throughout the territory could be obtained within 5 years by means of residual spraying methods.

In the Solomon Islands Protectorate there is no malaria control organization nor is one contemplated. Present control where it exists is by the use of larvicides and drugs.

On two islands of the New Hebrides residual spraying with DDT protects some 6,000 people. In addition larval control measures and suppressive drugs are used.

In Australia there is no formal malaria control organization, the work being part of the departments of health of the states and territory concerned. The School of Public Health and Tropical Medicine at Sydney provides a consultant malariologist to make malaria surveys in the south-west Pacific area for the South Pacific Commission.

The methods in use in the Netherlands New Guinea are referred to in Technical Paper No. 80 [see below, p. 153].

In his conclusions the author states that wartime measures achieved successful malaria control in a large population of non-indigenous people and some of the measures employed then would prove effective in peacetime. He makes the following comments:

(1) The first essential is that administrations must actively be persuaded that malaria in the indigenous peoples in the area is a serious problem detrimental to the health of the people, and is retarding the progress of the territory. In addition to stating the problem it must be stressed that malaria control must be instituted.

(2) Effective malaria control can only be secured if there is a malaria control organization with sufficient funds at its disposal.

(3) Research must be conducted at the same time.

(4) Liaison between territories with the free exchange of information is an essential feature, and more so in this instance as all the territories are concerned with the same vector species.

(5) Not much cooperation is expected from indigenous people so that supervision must be constant.
(6) A moral obligation to continue malaria control once it has been commenced must always be borne in mind.

In connexion with research the main problem is the behaviour of *A. farauti* and *A. punctulatus* and their reaction to residual spraying. Surveys must be continued in the highlands of New Guinea to determine the distribution of malaria and elucidate the factors responsible for its presence or absence in an actual area. Factual evidence is required to support the contention that malaria contributes to infant mortality. To what extent does drug prophylaxis used for labourers from malarious villages interfere with their tolerance to the disease? The vector mosquito in the northern territories of Australia has not yet been determined and indeed the extent of endemic malaria there is, at present, indefinite. To what extent is malaria responsible for the pathogenesis of liver enlargement? Hybridization of *A. punctulatus* and *A. farauti* may produce *A. koliensis*; this has not yet been clearly demonstrated.

Finally, the administrative problem is a difficult one; it has often been said concerning malaria control among the peoples of the south-west Pacific that nothing can be done beyond local measures until they have been educated to realize the importance of malaria. "The real truth lay in the fact that nothing would be done until the administrations had been educated and realized this self-same fact." *R. Ford Tredre*

Montestruc, E. La régression du paludisme à la Martinique. [**The Regression of Malaria in Martinique**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 2, 234–42, 1 fig.

This is the story of the remarkable decline in the incidence of malaria in Martinique. Fifty years ago malaria was far-and-away the most important cause of sickness and death in that Island.

For 2 years in succession the malaria parasite has not once been seen in the course of the numerous blood examinations carried out in the local Pasteur Institute. The decline in malaria incidence began in 1935, the year in which the distribution of prophylactic quinine and synthetic drugs was systematically commenced on a large scale. At first the decline was most marked in *P. vivax* infections. *P. vivax* was formerly the predominant species; by 1945 it had almost totally disappeared.

The construction of an aerodrome at Fort-de-France-Lamentin, which was begun in 1947, involved the reclamation of a large swampy area which had been a prolific source of mosquito breeding. Insecticidal spraying with DDT was only begun in 1951. Neither of these events, beneficial as both have been, can be credited with playing any important part in determining the remarkable regression of malaria in Martinique.

Norman White

VAN DER KUYP, E. **Malaria in Nickerie (Surinam).** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Sept., v. 7, No. 3, 259–62, 1 map.

Nickerie is the westernmost District of Surinam abutting on British Guiana. It is the most important rice-producing district of Surinam. Its population is 18,615, of whom 59 per cent. are Hindustani, 18 per cent. Indonesian, and 17·7 per cent. mulattoes.

In Wageningen, in the coastal area of the District, a large mechanized rice-cultivation project for Dutch farmers was started in 1951. It was to determine whether malaria was likely to hamper this enterprise that the author visited the District in June 1953. His observations are recorded in this paper.

The coastal region of Nickerie is free from malaria though *A. aquasalis* abounds in places and *A. oswaldoi* also occurs: neither species acts as a vector here. The villages along the Wayombo, Arrawarra and Upper Nickerie Rivers, in the savannah region of the District, are heavily infected with malaria and *A. darlingi* is prevalent. Fortunately these villages are far from Wageningen so vigilance should ensure the present immunity from malaria of that place. Eradication of malaria from savannah villages would be very difficult as the American Indians are semi-nomadic. *Norman White*

WOLCOTT, G. B. **Chromosomes of the Four Species of Human Malaria, Studied by Phase Microscopy.** *J. Heredity.* 1955, Mar.–Apr., v. 46, No. 2, 53–7, 2 figs.

The author describes the results of cytological observations on the nuclei of the 4 human malaria parasites, *Plasmodium vivax*, *P. malariae*, *P. falciparum* and *P. ovale*, which were studied by phase contrast microscopy. Infected blood, obtained from neurosyphilitic patients undergoing malariotherapy, was drawn into a white cell pipette, which had been rinsed with 1 per cent. heparin; a drop was mounted under a 22 mm. coverslip, and examined with oil immersion. Photomicrographs were taken at a magnification of × 2,000 and reproduced in this paper at × 3,000 with corresponding line drawings which facilitate the orientation and interpretation of the nuclear structures seen in the photographs.

The results of these observations were similar for all the 4 species of *Plasmodium*, the nuclear structure of which is visible only in the late stages of schizogony preceding segmentation. At this period the nuclei do not possess a membrane, and consist of two unequal chromosomes, the larger one measuring about 1 μ in length, and the two lying parallel at a distance not exceeding 1 μ between them. In view of the difference in length of the associated chromosomes, they are regarded as being non-homologous and representing the haploid condition of the nucleus.

Since (according to unpublished observations of the author) the gametocyte nuclei of *P. vivax* and *P. falciparum* are also haploid, meiosis in these parasites probably takes place after zygote formation.

The chromosome structure of the nuclei in the asexual forms of the species of human *Plasmodium* is clearly shown in the accompanying illustrations. *C. A. Hoare*

Jones, J. C. **Thoracic Vesicles in *Anopheles* Larvae.** *Mosquito News.* 1955, Sept., v. 15, No. 3, 168–70, 1 fig.

See also p. 251, Knierim *et al.*, **Feeding Adult Mosquitoes on Preserved Blood to Maintain Egg Production.**

Hedeen, R. A. **The Discovery of a Member of the *Anopheles maculipennis* Complex breeding in Treeholes in France.** *Mosquito News.* 1955, Sept., v. 15, No. 3, 161–2.

The author records the collecting, in 1954, of 13 larvae of *Anopheles maculipennis* from rot-holes of the trees *Platanus acerifolia* and *Fraxinus angustifolia* near La Rochelle and Rochefort, France.

Three of the larvae were bred out and produced females, but as no eggs were obtained it was not possible to determine the race of *A. maculipennis.*

This is believed to be the first record of this species being found breeding in a tree-hole. *H. S. Leeson*

Britz, L. & Höhne, W. Temperaturschwankung und Entwicklungsgeschwindigkeit bei *Anopheles atroparvus* (Diptera; Culicidae). [**Temperature Variation and Rate of Development in *Anopheles maculipennis atroparvus***] *Ztschr. f. Angewandte Zool.* 1955, No. 2, 209–34, 4 figs. & 2 graphs. [Numerous refs.]

Abul-Hab, J. **The Differentiation of Larval Populations of *A. sacharovi* Favr and *A. maculipennis* Meigen in North Iraq.** *Bull. Endem. Dis.* Baghdad. 1955, July, v. 1, No. 3, 265–73, 6 figs.

The 2 important mosquitoes, *Anopheles maculipennis* and *A. sacharovi*, both occur in the Suleimaniya area of North Iraq. As in other places where these species occur together they are fairly easily distinguished in the adult stage but are very difficult to separate as larvae.

In a search for some satisfactory means of differentiating the 2 larvae the author examined pure population samples of both species and applied statistical methods in the comparison of certain promising features of their chaetotaxy.

No character or combination of characters was found to be completely satisfactory, but 2 items, though not entirely constant, were thought to be of sufficient supplementary value to warrant their inclusion in existing keys for the separation of these 2 species.

[For the details of this enquiry interested entomologists are advised to consult the original.] *H. S. Leeson*

Davidson, G. **Further Studies of the Basic Factors concerned in the Transmission of Malaria.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, July, v. 49, No. 4, 339–50. [10 refs.]

Lira, in the northern province of Uganda, was selected as a suitable place for the comparison of malaria transmission at a cooler altitude with that of the hot, humid conditions of the coast. Details of the results of coastal studies in Tanganyika have already been published [this *Bulletin*, 1954, v. 51, 456], and should be read in conjunction with this abstract.

All 4 species of parasite occur at Lira but *P. falciparum* predominates. A parasitological survey of 921 people according to age-group gave the following crude parasite rate per cent. for infants: 2 weeks to 3 months—68; 4 to 6 months—83; 7 to 9 months—90, and 10 to 12 months—99. The malaria inoculation rate was calculated to be 0·0152 or one truly infective bite every 66 days (A); in comparison with the coastal zone the intensity of infection at Lira appears to be considerably higher up to the age 15; the rate at which new-born infants become infected is higher and in consequence the acquisition of immunity at Lira appears to be more rapid and more complete than at the coast, as indicated by the marked fall after the age of 3 months in the number of *P. falciparum* gametocyte infections exceeding a density of 100 per cmm.

The entomological techniques were similar to those employed at the coast. For the 4 months September to December the average sporozoite rates for *A. gambiae* and *A. funestus* were 14·6 and 6·2 respectively. The vector densities and their infection rates varied considerably over this period, transmission being at its highest in December when each person would be bitten by mosquitoes with sporozoites in their glands on 2 out of 3 days and at its lowest in September when the rate would be about 3 such bites every fortnight (B). Both species of mosquito are almost entirely anthropophilic, *A. gambiae* feeding on man every other day and *A. funestus* once in 2 days for about one-half of the period of these observations and once every 3 days for the other half.

The discrepancy in the inoculation rates derived from parasitological and entomological studies (A and B above) is attributable to the normal body defence mechanism preventing the maturation of a proportion of infections.

The respective daily mortality rates of *A. gambiae* and *A. funestus* at Lira were 3 and 7 per cent. respectively. It is estimated that the

probabilities of ingesting blood containing adequate gametocytes is 1·8 and 3·8 per 100 feeds respectively. This calculation from entomological data is comparable to the figure derived from parasitological data: 3·6 per cent. of feeds on man would result in infection of the mosquito.

The average number of *A. gambiae* and *A. funestus* feeding on a single individual in one day is about 3·2 and 3·1 respectively. This indicates that if the individual were truly infective he could originate some 20 secondary cases in completely susceptible persons every day, or a total of 1,600 secondaries in the total course of an untreated infection with malaria which was infective for 80 days. Therefore to control transmission of malaria in such a community it would be necessary to reduce this basic reproduction rate from about 1,600 to less than 1. This could be done by increasing the daily mortality of both species of mosquitoes to about 30 per cent., or possibly 50 per cent. among those mosquitoes actually entering houses. Such a mortality could be achieved and maintained by the use of a good DDT product at a dosage of 200 mgm. per square foot every 6 months; BHC at a dosage of 20 mgm. of the gamma isomer per square foot every 3 months; or dieldrin at a dosage of 50 mgm. per square foot every year [this *Bulletin*, 1953, v. 50, 1011]. The author concludes that despite the higher survival rates of the vector species in Lira compared with the coastal zone, control would be less difficult to achieve because of the much lower densities of the species.

R. Ford Tredre

Lacan, A. L'anophelisme des plateaux de Madagascar en 1952. [**Anophelines of the Plateau Region of Madagascar in 1952**] *Mem. Inst. Sci. Madagascar.* Ser. E. 1953, v. 4, 503–19, 2 figs. [17 refs.]

The author reports on the adult anopheline mosquitoes of the plateau region of Madagascar with some consideration of the effects of earlier anti-mosquito work with residual insecticides. The altitude of the plateaux varies from 1,100 to 2,650 metres. About 39,000 mosquitoes were examined in earlier investigations in 1935 and 1937, but, in spite of intensive searching in 1952, only 5,000 specimens could be found.

Anopheles funestus was absent from the catches although they made up more than 50 per cent. of the thousands of mosquitoes collected in 1935–37. *A. gambiae*, formerly second in abundance, now constituted only 14 per cent. of the total catch, being fewer than *A. coustani* and *A. squamosus*, respectively comprising 37 per cent. and 30 per cent. *A. marshalli* has become surprisingly quite numerous (12 per cent. of the catch of 1952) being formerly known only from 3 localities outside the plateaux limits. Other species taken in small numbers include *A. pharoensis* and *A. maculipalpis*. These changes in relative density are attributed to control measures by DDT residual spraying. This had been done twice annually for the 3 years preceding these observations. *A.*

coustani and *A. squamosus* are thought to be less readily killed by DDT and thus come to predominate over the more susceptible *A. gambiae* and *A. funestus*. The results for *A. gambiae* indicate that although 38 per cent. of them were positive for human blood by precipitin test, they occurred out-of-doors or in stables more than in houses. This is interpreted as a change of resting habits as a result of the anti-mosquito programme with DDT over the previous 3 years. *D. S. Bertram*

See also p. 252, Hamon, Étude biologique et systematique des Culicidae de l'île de la Réunion. [**Biological Study and Systematics of Mosquitoes in Réunion Island**]

Mohan, B. N. **Comparative Experimental Infections in** *Anopheles fluviatilis* **and** *Anopheles stephensi* **(Type) with** *Plasmodium falciparum* **Welch, 1897.** *Indian J. Malariology.* 1955, June, v. 9, No. 2, 81–4. [13 refs.]

By means of parallel feeding experiments, the susceptibility to infection with *Plasmodium falciparum* of *Anopheles fluviatilis* and *A. stephensi*, both of which mosquitoes are important vectors of malaria in different parts of India, was investigated under laboratory conditions.

Infective feeds of gametocytes were derived from 3 male human donors, showing respectively 10, 15 and 22 crescents per 100 leucocytes. Resulting infections were tabulated for each vector species and donor as (1) gut (oöcyst) infections, (2) salivary gland (sporozoite) or gut-plus-gland infections, (3) total infections of both preceding types.

In lot 1, where gametocyte density was lowest, and in lot 2 (intermediate gametocyte density), gut infection indices were higher, and gland infections (alone or with gut) lower, in *A. stephensi* than in *A. fluviatilis*. In lot 3, exposed to greatest gametocyte density, infection indices generally were higher, and about equal in the two anophelines, with gut infections predominating. A quantitative analysis of gut infections in lot 3 showed an average number of 50·3 oöcysts per gut in 19 positive *A. fluviatilis*, and 60·3 in 16 positive *A. stephensi*.

Total infections, irrespective of site, corresponded well in the two vectors. The indices, for lots 1, 2 and 3, were *A. fluviatilis* 36, 38 and 93 per cent., *A. stephensi* 22, 36 and 90 per cent., respectively. Both species are therefore highly susceptible to *P. falciparum*, and the initial gametocyte density is shown to be important in determining the resulting incidence of infection. [A number of minor printing errors occur at various points in the paper, but are not liable to cause confusion. However, p. 82, line 21, should read " . . . was lower in *A. stephensi* . . ." and not " was higher " as printed; similarly, p. 83, line 7, should read " The former were made . . .", and not " The latter . . .".]

N. R. Phillips

de Andrade, R. M., Rachou, R. G. & de Souza, M. A. Observações preliminares sôbre as variações estacionais de alguns fatôres físicos e químicos nas águas de criadouros de *A. darlingi* no Sul do Brasil. [**Preliminary Observations on Some Physical and Chemical Factors in Breeding Places of *Anopheles darlingi* in Southern Brazil**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1954, July, v. 6, No. 3, 415–18. English summary (5 lines).

The English summary appended to the paper is as follows:—

"The authors present the determination of temperatures (water and air), pH, total acidity, chlorinity, total calcium and magnesium hardness, calcium and magnesium of breeding-places of *Anopheles darlingi* Root, 1926 in Marques dos Reis Village, Jacarèzinho County, State of Paraná, Brazil, during two months, February (Summer) and July (Winter) 1952."

Foy, H., Brass, W., Moore, R. A., Timms, G. L., Kondi, Athena & Oluoch, T. **Two Surveys to investigate the relation of Sickle-Cell Trait and Malaria.** *Brit. Med. J.* 1955, Nov. 5, 1116–19. [15 refs.]

Dr. Foy and his collaborators have so far been the only group of workers who did not accept at all a possible relation between possession of the sickle-cell trait and response to malaria. This paper narrows the gap between their view and that held generally. They have surveyed two groups of East Africans. In the first they examined 991 adults and children from the Kambe and Duruma tribes with sickling rates of 33 per cent. and 9 per cent., respectively, and a malaria parasite rate of 60 per cent. There was no association between sickling and parasite rates in either tribe. In a second survey 1,305 Jaluo children under the age of 6 years were examined. The sickle-cell trait was 18 per cent. and the parasite rate about 60 per cent. In one area there was no association between sickling and either parasite rate or parasite density. In another there was a very strong association. The authors could find no obvious explanation for this difference between the two areas.

This paper contains an interesting discussion of the complexity of the problem. The authors point out that if the situation were quite simple and all persons homozygous for the sickling gene were to develop anaemia and die before reaching the reproductive age, and if there were no differential fertility, no different mortality other than that of homozygotes, and mutation were negligible, it would take only ten generations to reduce the sickle-cell-trait rate from 20 per cent. to 10 per cent. and twenty generations to reduce it from 10 per cent. to 5 per cent. Strong reasons are put forward for supposing that the rate of change would be considerably slower than this and that the effect of selective advantage or disadvantage would take hundreds of years to become appreciable. Particularly important is that in contrast to the relative consistency of

gene frequencies the incidence of malaria in a population can change rapidly as a result of alterations in environment due to control measures or from movements into areas where people will encounter parasites to which they have no immunity. *H. Lehmann*

Payet, M., Pène, P. & Camain, R. Les altérations hépatiques au cours du paludisme en milieu africain à Dakar. [**Hepatic Changes in the Course of Malaria as observed in the African Population of Dakar**] *Bull. et Mém. École Préparatoire Méd. Pharm. de Dakar.* 1954, v. 2, 13–22, 8 figs. [44 refs.]

The authors report on studies of 60 cases of *P. falciparum* malaria occurring in the African population of Dakar. Twenty were cases of acute malaria, 40 were patients deemed to be suffering from the effects of recurrent or chronic malaria. All were residents in a hyperendemic zone. The histology of liver biopsies is described. In the 20 acute cases reversible changes were found but the authors unhesitatingly attribute the cirrhosis of chronic cases to malaria. In support of their views they claim a significant reduction in the incidence of cirrhosis of the liver in areas of anopheline control.

[Until the aetiology of cirrhosis of the liver is more fully understood it is difficult to exclude factors other than malaria.]

Frederick J. Wright

See also p. 230, Holmes *et al.*, **The Serum Protein Pattern of Africans in Uganda: Relation to Diet and Malaria.**

North, E. A. & Lehmann, N. J. **Recurrence of Benign Tertian Malaria following Injection of Tuberculin.** *Med. J. Australia.* 1955, July 30, v. 2, No. 5, 164.

In November 1949 a man of 53 contracted *P. vivax* malaria in New Guinea and was treated with proguanil. He had only one typical paroxysm and was completely free from any symptoms of relapse for 5 years.

On December 1, 1954, a Mantoux test (125 units of PPD) was carried out in Melbourne, Victoria. There was a moderate reaction, with an area of infiltration of 25 mm. in 48 hours, but no vesiculation or necrosis.

Within a few hours there were general symptoms of chill, malaise and pain in the limbs which persisted for a few days. On December 5 there was a definite paroxysm followed by profuse sweating and during the next week tertian periodicity developed. On December 14, just before a paroxysm was due, *P. vivax* was found in the blood and the paroxysm developed that afternoon. Treatment with proguanil was instituted and the patient has remained free from further attacks.

The authors note the long period before the relapse, namely 5 years. Naturally acquired malaria is virtually unknown in Victoria.

It is suggested that "a reaction of the delayed or bacterial type of allergy" may precipitate a relapse of *P. vivax* malaria and it seems likely that other biological substances may also do so.

H. J. O'D. Burke-Gaffney

Covell, G. **Developments in the Chemotherapy of Malaria during the last 40 Years.** *Roy. Soc. for Promotion of Health J.* 1955, Oct., v. 75, No. 10, 758–60.

The article forms the subject of the author's presidential address to the Tropical Hygiene Section at the Health Congress at Bournemouth in April 1955. In it he describes his experiences in the management of malaria over a period of some 40 years, starting just before the first world war. Quinine was then the chief drug used in treatment and prophylaxis and enormous doses were given. The Malaria Commission of the League of Nations did much to foster the development of malarial chemotherapy between the wars.

The first successes in the synthetic field were obtained by the Germans with Plasmochin (pamaquin) and atebrin (mepacrine). The latter drug proved of particular value in treatment and prophylaxis of all forms of malaria. About 1934 the substance resochin, a 4-aminoquinoline also synthesized by the Germans but not adequately tested clinically by them and now known as chloroquine, was proved of great value. A near relative sontoquine was much less efficient. Since the end of the second world war chloroquine has found favour in America as a quick-acting antimalarial with few side effects. Another 4-aminoquinoline, camoquin (amodiaquine) is also an effective antimalarial. The discovery followed of proguanil (Paludrine) and Daraprim (pyrimethamine), both of which, unlike the 4-aminoquinolines, can be produced cheaply; they are efficient but slow acting drugs whose greatest value is in prophylaxis and suppression. Two 8-aminoquinolines, pentaquine and especially primaquine, synthesized in the United States, are of value in preventing relapses in *P. vivax* infections. There is thus quite a formidable list of drugs available for treatment of malaria and not least in importance is quinine which, unlike some of the newer drugs, does not give rise to drug-resistant strains of malaria parasites.

J. D. Fulton

Abbott, P. H. **Trials with Camoquin and Daraprim in the Treatment of Malaria at Wad Medani, Sudan.** *Sudan Med. J.* 1955, Apr., v. 1, No. 3, 33–8.

The author reports on the use of amodiaquine (Camoquin) and pyrimethamine (Daraprim) in the Blue Nile Province of the Sudan. Over 200 cases of acute malaria were treated with a single dose of oral

amodiaquine (adult dose 0·6 gm. [presumably of base]). Patients who were in coma, nauseated or vomiting were treated parenterally by other drugs. Good results from oral amodiaquine were obtained in all cases. Of 35 cases of *P. falciparum* malaria, in which full records were kept, defervescence of fever ensued in less than 36 hours in 34 cases, parasitaemia persisted for longer than 36 hours in 7 cases. Only one doubtful relapse was observed. [No control series was observed but the degree of premunition was presumably not high, as the patients showed symptoms of acute malaria and some failures occurred when pyrimethamine was used for other patients.]

Only a few cases of *P. vivax* malaria were treated. Pyrimethamine in a dose of 50 mgm. on 2 successive days failed in treatment in 7 cases out of 24, other antimalarials having then to be administered. In a weekly dose of 25 mgm. (children 12·5 mgm.) pyrimethamine appeared to be an effective prophylactic for 50 British residents but the incidence of malaria among those not taking a prophylactic drug was low during the period of observation and failures of prophylaxis by pyrimethamine have been reported from Dueim. A British child, aged 3½ years, survived after consuming 15 tablets of pyrimethamine. [Although vomiting saved this child the attractiveness of pyrimethamine to children is a real hazard of the drug.] *Frederick J. Wright*

Merle, F. & Maillot, L. Campagnes de désinsectisation contre le paludisme à Brazzaville. [**Antimalaria Insecticidal Activity in Brazzaville**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 2, 242–69, 3 charts. [12 refs.]

This somewhat discursive report describes the topography of Brazzaville, French Equatorial Africa, the complex malaria problems to which it gives rise, and the many-sided efforts persistently carried out in recent years that have resulted in a marked reduction of malaria endemicity.

Brazzaville is on the right bank of the Congo, which separates it from Léopoldville, and adjacent to Stanley Pool. The town stretches some 10 kilometres along the river bank, the African quarters constituting the outlying parts of the town at either end. An enormous work of urbanization has taken place during the last 10 years in both the European and African quarters: permanent structures are rapidly replacing the African shacks. The African population has more than doubled during this decade and now numbers about 100,000. The European population is about 5,000. Several small streams flow through both European and African quarters to the river.

Vital statistics show a remarkable improvement in health conditions. In 1944 there were only 2 births for each death. In 1953 and 1954 there were 5 births for each death. The improvement is attributed in chief measure to malaria control.

Five species of *Anopheles* are found:—*gambiae*, *moucheti*, *constani*, *marshalli* and *nili*. Only two, *A. gambiae* and *A. moucheti*, have been incriminated as malaria vectors: the rôle of *A. moucheti* in this respect is, however, almost negligible.

Up to 1951 chief attention was concentrated on antilarval measures including small drainage and reclamation work. In that year insecticidal spraying of dwellings on a small scale was begun. In 1952 antilarval measures were intensified; aeroplanes and helicopters were used, and prophylactic medication was used in the schools. Insecticidal spraying of houses was systematized and extended; each house was sprayed twice a year. Malaria has become hypoendemic, but the eradication of the disease can hardly be hoped for in such a town as Brazzaville as mosquitoes and infected Africans are constantly infiltrating into the town. The measures used, the results of epidemiological surveys and the effects of the control methods are fully discussed. *Norman White*

SUBRAMANIAM, H. **Malaria Control in Lower Bhavani Project Headworks, Coimbatore District, Madras State.** *Indian J. Malariology.* 1955, June, v. 9, No. 2, 125–35, 2 maps & 1 chart.

The River Bhavani rises in the eastern slopes of the Western Ghats and flows a sinuous course through the Coimbatore District to join the Cauvery River. In 1948 work was begun on the construction of a dam across the Bhavani River. The dam is 5½ miles long and will be capable of impounding 28,000 million cubic feet of water. It will bring more than 200,000 acres of land under irrigation.

The dam site was sparsely populated. In 1947 the spleen rates of 6 small villages in the area varied from 10 to 22·7 per cent. The local population was negligible compared with the large influx of labourers. These numbered more than 40,000 in 1950. Thereafter the number dwindled to 11,000 in 1954. To accommodate this labour force a township came into being. Here the housing was satisfactory, and in addition temporary sheds and huts constructed by the labourers themselves provided shelter.

The anopheline fauna of the district was restricted to *A. culicifacies*, *A. subpictus* and *A. vagus*.

Energetic control measures were started early. DDT spraying has been extensively used. The main camp and adjacent smaller camps were sprayed every 6 weeks, peripheral villages were sprayed 4 times a year.

There was practically no local transmission of malaria throughout the period. During 1952 and 1953 malaria was responsible for only 1·04 and 0·9 per cent. of the 15,000 cases treated in each of those years in the Camp Hospital. A quarterly survey of all children in the camps was carried out. In 1950 the spleen rate was 3·8 per cent.; in 1953 no child

with an enlarged spleen was seen. No malaria parasite was found in the blood of the children during 1952 or 1953. The annual *per caput* cost for malaria control in the project varied from 0·26 to 0·68 rupee.

Norman White

South Pacific Commission. Noumea, New Caledonia. **Malaria Control and Research in Netherlands New Guinea** [Black, R. H.]. *Technical Paper No. 80.* 1955, Mar., mimeographed pp. v + 16, 2 maps. [2s.; 18 fr. CFP.]

The headquarters for the malaria control service of Netherlands New Guinea are in Hollandia under the directorship of Dr. D. Metselaar. Outside this centre malaria control work is in the charge of district medical officers who will in future, it is hoped, undergo a course of training for a period of 3 months at the proposed new malaria laboratory. At headquarters, courses of instruction for training local students as malaria technical assistants enable them to acquire the diploma of malaria "Mantri"; they are proficient in the diagnosis of malaria plasmodia in blood cells, in mosquito anatomy and identification and in the use of keys; they are familiar with breeding places, with elementary map drawing and with the usage of antimalarial drugs.

Malaria control work in the Hollandia area consists mainly of chemoprophylaxis and larval control. Europeans receive Paludrine [proguanil], one 100 mgm. tablet three times a week. The larvicide in general use is oil without the addition of DDT. Houses built by the administration are screened against mosquitoes. In this area the principal mosquito vectors are *Anopheles farauti* and *A. punctulatus.*

The Netherlands New Guinea Petroleum Company is centred in Sorong. Among employees the malaria attack rate in 1947 was 62 per 1,000 per week and in 1953 had fallen to 2·8 per 1,000 per week. The main malaria control measure is the use of oil as a larvicide. The above-mentioned anophelines are the vectors of importance in this oil area. Other oil fields are similarly controlled. Islands off the mainland are highly malarious.

Professor P. H. van Thiel of Leyden University studied the behaviour of local anophelines in relation to treatment of human habitations with residual insecticides. A pilot experiment was carried out in the Sentani Lake area [see below]; this is a fresh-water lake lying a few kilometres inland from Hollandia; villages are scattered along its shore and on small islands in the lake, the houses being built over the water and usually containing several family units. The population is about 4,000. Anophelines breed in the sago swamps extending from the edge of the lake. The anopheline infection rate is between 1 and 2 per cent. and the vector species are *A. punctulatus*, *A. farauti* and *A. karwari.* DDT wettable powder has been applied to housing with a spraying dosage of 2 gm. per square metre. It is intended that this pilot scheme should

form a basis for the assessment of results and for the probable extension of this method of malaria control to other parts of the area.

R. Ford Tredre

VAN THIEL, P. H. & METSELAAR, D. **A Pilot Project of Residual Spraying as a means of controlling Malaria transmitted by Anophelines of the *punctulatus* Group in Netherlands New Guinea.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, June, v. 7, No. 2, 164–81, 4 figs. [Numerous refs.]

The efficacy of indoor residual spraying in the control of endemic malaria transmitted by mosquitoes of the *Anopheles punctulatus* group is open to question. [See, for example, this *Bulletin*, 1950, v. 47, 211.] This problem affects the whole of the south-west Pacific area so that considerable importance is attached to the research work described in this paper.

On the outskirts of Hollandia, Netherlands New Guinea, 3 identical miniature local-type dwellings were constructed on piles. The walls were of ribs of sago palm, the roof of sago palm leaves and floor of nibung palm (*Oncosperma* sp.) bark boards. The eaves could be closed on the inside by valves made of hardboard and the walls were fitted with outlet traps; mosquitoes entered the houses through the open eaves. The valves in the eaves were opened at different hours of the night during the test so that the influx of mosquitoes at different times could be recorded. The entomologist must refer to the original paper for the very detailed account of the observations made in these test houses of the behaviour of local anopheline species. In brief, these observations showed a marked tendency for anophelines to enter the house between 7 p.m. and midnight or later and not to leave before daybreak. It is inferred that after sucking blood they rest on interior surfaces and would thus be subject to the effects of a residual insecticide applied to those surfaces. Only a small proportion of anophelines which tried to leave the experimental house by the traps had not sucked blood. A dark night encourages the anophelines not to leave the house until daybreak and a subdued light is a further inducement for them to remain. This chance of contact with insecticide applied to all local anophelines but to *A. koliensis* in particular as it preferred to bite man indoors whereas *A. farauti* had a preference for biting out of doors.

After the end of the biological investigation one experimental house was sprayed with DDT and a second with dieldrin; anophelines caught in the third unsprayed house served as controls in the survival test made with specimens collected alive in the traps of the sprayed houses. The results reported are limited to a period of 6 weeks after spraying. In the house sprayed with DDT, 3–20 per cent. of the anophelines escaped the lethal effect of the insecticide; the effect of dieldrin was 100 per cent.

A more extensive field experiment has been instituted in the Sentani

Lake district, near Hollandia, the results of which will be published by Metselaar. [This paper is an excellent record of scientific methods applied to the study of the behaviour of local mosquitoes, and to observing the effects of residual insecticides.] *R. Ford Tredre*

Floch, H. La sixième campagne de lutte antipaludique en Guyane Française. [**The Sixth Antimalaria Campaign in French Guiana**] *Arch. Inst. Pasteur de la Guyane Française. Publication No. 349.* 1954, Dec., 71 pp., 4 figs. [17 refs.]

This report details the residual spraying work carried out during the sixth year's intensive insecticidal campaign in French Guiana. At the end of the fifth year the author was able to report the elimination of *Aëdes aegypti* and a 98 per cent. reduction in malaria morbidity [this *Bulletin*, 1955, v. 52, 12]. The sixth campaign was extended to cover the whole territory: 27,558 individuals occupying 40,285 rooms in 9,873 houses were afforded the protection that spraying conferred. Of the total surfaces sprayed 14 per cent. were treated with a watery suspension of DDT, 35 per cent. with a suspension of DDT in kerosene, 34 per cent. with a watery suspension of BHC, 12 per cent. with a kerosene suspension of BHC and 5 per cent. with a watery suspension of Octachlor [chlordane]. Only 9 cases of malaria were recorded during 1953, in all of which infection had been contracted outside the colony. In the schools of Cayenne only 3 children were found with enlarged spleens; one of these had been only 3 months in French Guiana, and a cause other than malaria was responsible for splenic enlargement in the other two. The much lowered death rate and increased birth rate continues. It is estimated that before the present campaign malaria was responsible for 30 per cent. of the total mortality of French Guiana. The prevalence of both *A. darlingi* and *A. aquasalis* has been reduced to an almost insignificant level. *Norman White*

Sautet, J. & Caporali, J. Influence chez la souris blanche de divers régimes sur l'évolution de *Plasmodium berghei*. [**Influence of Different Diets on the Development of** *Plasmodium berghei* **in White Mice**] *Méd. Trop.* Marseilles. 1955, Mar.–Apr., v. 15, No. 2, 222–8, 1 chart. [11 refs.]

The author reviews the results of various workers on the effect of a milk diet on the course of infection in different laboratory animals by different species of plasmodia [this *Bulletin*, 1953, v. 50, 384, 1121; 1954, v. 51, 145, 772]. These results are by no means concordant. The subject has been reinvestigated by using small numbers of newly weaned mice which were kept on a definite diet for 12 weeks. The diets consisted of (1) bread and water, (2) bread and unprocessed milk, (3) bread

and pasteurized milk. There was a difference in the fat and vitamin content of the two types of milk. Infection was by blood given intraperitoneally and the course of infection was followed in stained films. The milk diet appeared to have little or no influence on the resulting infection whatever the number of parasites injected. For valid conclusions to be reached on the manner in which diet influenced the course of infection it appeared that much larger numbers of animals were necessary. The prepatent period was proportional to the number of parasites in each inoculum but the mortality rate was unaffected by the number of parasites injected. *J. D. Fulton*

Sautet, J., Caporali, J., Ausseil, M. & Castelli, P. Influence du régime sur le traitement des affections expérimentales a *Plasmodium berghei* chez la souris blanche. [**Influence of Diet on the Treatment of Infections with** *P. berghei* **in the White Mouse**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 2, 175–80.

The authors have published recently their results on the effect of different diets on the course of *P. berghei* infections in mice [above]. They are of the opinion that the much discussed effect of a milk diet on this infection is a reflection of the type and quality of milk used. They have now studied the action of various antimalarial agents (quinine, Nivaquine, Quinacrine [mepacrine] and Malocide) on blood-induced *P. berghei* infections in mice maintained on various diets including bread and water, and on the same diet plus pasteurized as well as non-pasteurized milk, given for 2 weeks before inoculation. A total of 314 mice were used, 10 in each group, and the drugs were given by mouth. Observations on mortality among the animals extended over a period of 3 months. At all stages deaths were commoner in the mice receiving the poor diet, that is with no milk, and after 3 months cures were observed only in the animals receiving milk. Nivaquine, Quinacrine and Malocide were the most effective of the drugs used. It appeared that the amount of drug required for a particular effect with different diets showed as much variation as when normal and reputedly resistant strains of parasite were used. The two types of milk used caused no appreciable difference in the infection. *J. D. Fulton*

de Smet, R. M. Variations du rapport protéines totales/globulines du sérum lors de l'infection par *Plasmodium berghei*. [**Variations in the Ratio of Total Proteins to Globulins in the Serum of Animals on Infection with** *P. berghei*] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 385–9.

White mice aged 3–4 months, rats aged 2–3 months and wild *Cricetomys ansorgei* of unknown age were used in studying the change

in the ratio of total proteins to globulins in serum as a result of infection with *P. berghei*. For this purpose pooled blood was obtained by cardiac puncture from animals previously starved for 24 hours, collected in paraffined tubes and centrifuged immediately. Only the serum of animals judged sufficiently free of intestinal infections to avoid alteration in its composition were used and serum coloured as a result of haemolysis was also rejected. The ratio of total proteins to globulins differed but little in control and infected mice. There was an appreciable decrease in the ratio in the case of rats and marked decrease in the case of *Cricetomys ansorgei*. The variable results in the different animal species correspond to differences in susceptibility to the infections. Whereas in mice the infection is almost invariably fatal, the rat generally survives the infection and in *Cricetomys ansorgei* relapses are frequent and immunity phenomena occur.

[There is no indication of the methods employed in estimating proteins or globulins.] *J. D. Fulton*

Menon, M. K. & Nair, C. P. **Studies on Nuri Strain of *P. knowlesi*. Part VI. Some Observations on Haematology and Temperature Reaction in Blood-Induced Infection.** *Indian J. Malariology*. 1955, June, v. 9, No. 2, 99–104. [20 refs.]

In this investigation a total of 29 rhesus monkeys of either sex were used to study the changes taking place in the number of red and white blood cells, in their fragility and haemoglobin content during the course of infection with *P. knowlesi*. Changes in body temperature during infection were also noted. The observations were begun before infection and continued till death resulted. The results, which are of interest to those who work with these animals, are set out in tables A marked reduction in red cell count and in haemoglobin values was found to occur during infection. The variation in leucocyte count was small. Only insignificant changes occurred in the fragility of parasitized cells and in body temperature during the whole course of the disease.

J. D. Fulton

Nair, C. P., Bami, H. L. & Ray, A. P. **Studies on Nuri Strain of *P. knowlesi*. Part VII. Comparative Efficacy of the Active Metabolite and the Precursor (M.3349) of Proguanil.** *Indian J. Malariology*. 1955, June, v. 9, No. 2, 105–10. [13 refs.]

The efficacy of the metabolite of proguanil [this *Bulletin*, 1952, v. 49, 362], that of the parent substance and one of its precursors, M.3349, has been compared in 80 rhesus monkeys by the methods of Nair *et al.* (*Indian J. Malariology*, 1953, v. 7, 371). The animals were all inoculated intravenously with infected blood and the drugs were given orally in daily doses for 7 days, starting when the infection was mild. The course of infection was followed in stained smears. In the absence of relapse over

a period of one month splenectomy was carried out to establish whether radical cure had been effected. It appeared that the efficacy of the metabolite of proguanil varied with the nature of the host and the species of plasmodial infection, as may be gathered from the results previously described [this *Bulletin*, 1952, v. 49, 1025; 1954, v. 51, 773; 1955, v. 52, 16]. In the present investigation the parent substance proved about 175 times as active as its metabolite, in marked contrast to its effectiveness on plasmodia of rodents and birds. The dose response curve of this substance and of M.3349 was flat in character and at doses corresponding to the MED relapses were frequent and suggested to the authors that resistance to the drug was occurring. *J. D. Fulton*

Mohan, B. N. **Comparative Susceptibility of some *Aëdes* Mosquitoes to *Plasmodium gallinaceum*.** *Indian J. Malariology.* 1955, June, v. 9, No. 2, 75–9.

Six species of *Aëdes* type mosquitoes were compared qualitatively, and in some cases quantitatively, for their susceptibility to *Plasmodium gallinaceum*.

Qualitative investigation by gut examination after an infective feed showed 100 per cent. infections in *Aëdes jamesi* and *Armigeres obturbans* (based upon two specimens), of which the former is very restricted in distribution. The infective indices of the other 4 species were *Aëdes albopictus* 93 per cent., *A. aegypti* 82 per cent., *A. pseudotaeniatus* 40 per cent. and *A. vittatus* 25 per cent.

Detailed qualitative and quantitative estimates were made for *A. aegypti* and *A. albopictus*, and for *A. aegypti* and *Armigeres obturbans*. Qualitatively, based on gut and salivary gland infections, *Aëdes albopictus* (total positive 85 per cent.) was again shown to be more susceptible than *A. aegypti* (total positive 66 per cent.); gut infections were commoner than gland infections in both species. For *A. aegypti* and *Armigeres obturbans*, on the same basis, both species showed 100 per cent. gut infections, but gland infections were again fewer.

Quantitative determinations were then made by counting the number of oöcysts per positive gut. Although variable in different experimental lots, *Aëdes albopictus* showed higher average numbers (90·0, 215·0 and 8·5 per positive gut) than *A. aegypti* of the corresponding lot (47·5, 77·6 and 3·6 per positive gut). The average numbers of oöcysts were also greater in *Armigeres obturbans* (324·81 per positive gut) than in *Aëdes aegypti* (135·46 per positive gut).

From the results of these experiments *A. albopictus* appears more susceptible than *A. aegypti*; both species are common and widely distributed in India. However, a very high susceptibility and oöcyst density indicate that *Armigeres obturbans* is the most efficient vector of *P. gallinaceum*; this fact, together with the ease with which the salivary glands may be dissected out, compared with *Aëdes* spp., makes

Armigeres obturbans eminently suitable for experimental infections with *P. gallinaceum*. *N. R. Phillips*

Jaswant Singh & Mohan, B. N. **Susceptibility of *Culex* (Culex) *bitaeniorhynchus* Giles, 1901, to *Plasmodium relictum* but not to *Plasmodium gallinaceum* and *Plasmodium falciparum*.** *Indian J. Malariology.* 1955, June, v. 9, No. 2, 71–4.

By means of comparative feedings, with known vectors as controls, the susceptibility of *Culex bitaeniorhynchus* to 3 species of *Plasmodium* was tested. Three series of experiments were carried out, starved female mosquitoes (experimental and control) being allowed to feed upon a proved carrier of gametocytes of the *Plasmodium* species concerned in each case. Fully engorged mosquitoes were then removed, and subsequently dissected (gut and salivary glands) for determination of infection percentages.

For *P. relictum* harboured by sparrows, with *C. fatigans* as control, all of 21 *C. bitaeniorhynchus* and all of 7 controls were positive; of the 21 *C. bitaeniorhynchus*, all were gut-positive and 14 were gland-positive.

With *P. gallinaceum* in a fowl, *Aëdes aegypti* being used as control, none of 418 *C. bitaeniorhynchus* was positive; the average percentage of controls positive was 83 (54 of 65 dissected). Dissections of *C. bitaeniorhynchus* were commenced only after the development of sporozoites in the salivary glands of *Aëdes aegypti*.

For *P. falciparum* present in human volunteers, none of 151 *C. bitaeniorhynchus* became positive. The controls in this case were *Anopheles stephensi* (25 positive of 78, or 32 per cent.) and *A. fluviatilis* (69 positive of 183, or 38 per cent.). Most of the *C. bitaeniorhynchus* dissections were made after sporozoites had appeared in the controls.

C. bitaeniorhynchus is therefore considered to be highly susceptible to *P. relictum*, but refractory to *P. gallinaceum* and *P. falciparum* under laboratory conditions.

[See also this *Bulletin*, 1938, v. 35, 198; 1940, v. 37, 741.]

N. R. Phillips

Al-Abbass, A. H. *Plasmodium praecox* **in Iraq. A Survey of 108 sparrows in the Suburbs of Baghdad.** *Bull. Endem. Dis.* Baghdad. 1955, July, v. 1, No. 3, 237–8.

"From 108 sparrows collected and examined for birds plasmodia, 11 were found infected with *Plasmodium praecox*. This constitutes 10% of infection among sparrows collected from the suburbs of Baghdad. Only one sparrow found infected with both *Plasmodium praecox* and *Haemoproteus sp.*"

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:*—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

Noble, E. R. **The Morphology and Life Cycles of Trypanosomes.** *Quart. Rev. Biol.* 1955, Mar., v. 30, No. 1, 1–28, 10 figs. [Numerous refs.]

In this paper the author gives a general survey of the morphology and life cycles of trypanosomes, based on data from the literature and on his own studies. After an outline of the classification of the more important mammalian species of *Trypanosoma*, methods of their cultivation are discussed. [Here it is erroneously stated that *T. congolense*—which had been successfully cultivated by Reichenow (this *Bulletin*, 1935, v. 32, 34) cannot be grown *in vitro*.] An account is then given of the cytology of these flagellates, followed by a description of their reproduction. The next section deals with polymorphism in trypanosomes. This phenomenon is extended to the forms encountered in the blood of the vertebrate host, to the stages of development in the invertebrate and those in culture. It is concluded that the blood forms of all trypanosomes are trimorphic. [This conclusion will be contested by most medical and veterinary protozoologists, who restrict the concept of polymorphism to the blood forms of certain trypanosome species, while others are regarded as being monomorphic.] A critical review is then given of sexual phenomena in trypanosomes; it is pointed out that, in the absence of cytological evidence of syngamy, its existence remains doubtful.

The life cycles of trypanosomes in the invertebrate and vertebrate hosts are described in some detail, especially that of *T. cruzi*, which has been specially studied by the author, who tends to support the views held by Elkeles and Wood [see this *Bulletin*, 1951, v. 48, 793; 1952, v. 49, 126].

The paper is illustrated by a series of diagrams and schematic figures, and contains numerous references (in the text and bibliography) to the literature on trypanosomes. *C. A. Hoare*

Fairbairn, H. & Watson, H. J. C. **The Transmission of *Trypanosoma vivax* by *Glossina palpalis*.** *Ann. Trop. Med. & Parasit.* 1955, Oct., v. 49, No. 3, 250–59, 3 figs. [15 refs.]

"1. In an investigation in Nigeria into the causes of an increase in the percentage of *Glossina palpalis* infected with *Trypanosoma vivax* during the rainy season, infection rates were found to be correlated with temperature and with the mean length of the trypanosomes on which the flies had fed.

" 2. In *G. palpalis* adults which had emerged from pupae kept at temperatures ranging from 24° to 26°C. and had fed on a sheep infected with *T. vivax*, there was a significant reduction in the infection rate of flies maintained at 28–29°C., as compared with those maintained at 23°C., and a further significant reduction in flies maintained at 28–29°C. as compared with those maintained at 30°C. There was a similar trend in the flies which had emerged from pupae kept at 28–29°C., although the reduction in the infection rates was not statistically significant.

" 3. With an increase of pupal temperature from 24–26°C. to 28–29°C., there was a significant increase in the infection rates of flies at all fly-maintenance temperatures.

" 4. The survival rate of flies maintained at 28–29°C. or at 30°C. was significantly less than that of flies maintained at 23°C. or at 24–26°C.

" 5. No transmissions were obtained from flies which had emerged from pupae kept at 23°C. and had subsequently been maintained at 23°C.

" 6. There was no difference in the infection rates of male and female flies in any of the pupal and fly-maintainance temperature-groups.

" 7. In flies which had emerged from pupae kept at 24–26°C. and had subsequently been maintained at 23°C. or at 24–26°C., there was a significant correlation between the mean length of the trypanosome taken up in the blood-meal and the percentage of flies subsequently infected.

" 8. For the laboratory transmission of *T. vivax* by *G. palpalis* it is recommended that the pupae should be incubated at 28°C. and the flies maintained at 23°C."

Sen, H. G., Dutta, B. N. & Ray, H. N. **Effect of Starvation on the Course of experimentally induced** *Trypanosoma evansi* **Infection in Rats.** *Indian J. Vet. Sci. & Animal Husbandry.* 1955, June, v. 25, Pt. 2, 143–8, 1 fig. [20 refs.]

Gross nutritional deficiency of the host did not restrict the multiplication of the parasites.

Sen, H. G., Dutta, B. N. & Ray, H. N. **Milk Diet in** *Trypanosoma evansi* **Infection in Rats.** *Indian J. Vet. Sci. & Animal Husbandry.* 1955, June, v. 25, Pt. 2, 117–20. [11 refs.]

Milk diet did not alter the course of the infection in experimental rats.

David, A. & Nair, C. P. **Observations on a Natural (Cryptic) Infection of Trypanosomes in Sparrows** (*Passer domesticus* **Linnaeus.) Part I. Susceptibility of Birds and Mammals to the Trypanosomes.** *Indian J. Malariology.* 1955, June, v. 9, No. 2, 95–8.

" Trypanosomes in the salivary glands of *C. fatigans* fed on house-sparrows, were observed, for the second time, in the laboratories of the

Malaria Institute of India. The susceptibility of birds such as nightingales, parrots, crows, pigeons, seven sisters, black-headed mynas, quails, fowls, chicks, red munias, grey partridges, and mammals such as monkeys and rats, to this strain of trypanosome, was determined. As the trypanosomes were not to be seen in the blood of any animal, the criterion followed in all the cases was to look for the developmental forms in the mosquitoes after they were fed on the respective infected hosts.

"All the animals proved to be capable of taking up the infection but among these, parrot appeared to be most susceptible, and grey partridges the least."

[See this *Bulletin*, 1951, v. 48, 878.]

de Lucena, D. T. & Costa, L. Epidemiologia da Doença de Chagas na Paraíba. [**Epidemiology of Chagas's Disease in Paraíba**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1954, Apr., v. 6, No. 2, 229–65, 2 figs. & 5 maps. English summary.

An intensive survey was undertaken by the authors during the period from March 1952 to June 1953 to investigate the epidemiology of Chagas's disease in Paraíba (one of the smaller States of Brazil). Emphasis is mainly on the entomological aspects, with enumeration of the geographical distribution of the vectors encountered, the frequency of their occurrence in human dwellings, and their incidence of infection with *Trypanosoma cruzi*.

For survey purposes, the State was divided into 6 physiographical regions, which comprised 513 localities in which observations were made, covering the 42 counties of the State. In all, 6,749 human habitations were searched, of which 402 (almost 6 per cent.) harboured Triatominae. The infested habitations were distributed between 39·18 per cent. of the localities investigated, in 40 of the 42 counties. Infected triatomids were present in 42 dwellings, among 6·43 per cent. of investigated localities, from 50 per cent. [presumably 21] of the counties; for the whole State, the incidence of infected triatomids was 2·89 per cent. (Tables are given to show the distribution by numbers of infected and non-infected triatomids in the habitations and localities investigated, both for individual counties and grouped collectively under physiographical regions).

Four species of triatomids were found; the presence of *Triatoma rubrofasciata*, previously recorded for the State, was not confirmed. Of those present, *Panstrongylus megistus* was the dominant species, with an incidence, relative to the other species, of 80·91 per cent.; it occurred especially in the more humid eastern regions of the State. The distribution of *T. maculata* was more uniform, this species having a relative incidence of 13·26 per cent. *T. brasiliensis* had a relative incidence of 6·73 per cent., and its distribution was found to be the opposite of *P.*

megistus, with predominance in the western regions. The fourth species, *P. lutzi*, occurred only rarely (and was not incorporated into estimates of relative incidence).

With the exception of *P. lutzi*, all the triatomid species encountered were found to be naturally infected with *Trypanosoma cruzi*. The highest index of infection in a particular region was one for *Triatoma brasiliensis* of 17·07 per cent. Infection indices for all regions were *T. brasiliensis* 9·09 per cent. (21 infected of 233 examined), *T. maculata* 2·84 per cent. (13 infected of 459 examined) and *P. megistus* 2·38 per cent. (65 infected of 2,769 examined). However, when correlated with the overall number of triatomids, the proportion infected for each species was *T. brasiliensis* 0·61 per cent., *T. maculata* 0·38 per cent. and *P. megistus* 1·90 per cent.; these figures are considered to indicate the relative importance of the species as vectors in Paraíba. (The distributions of the vectors, and their indices of infection, are listed in the text and tabulated for localities, counties and physiographical regions; geographical distributions are also presented in map form at the end of the paper.)

The organism infecting the triatomids was identified as *Trypanosoma cruzi* by (i) morphological examination of the trypanosomes in fresh and stained preparations of the vector's intestinal contents, (ii) intraperitoneal inoculation into white rats and guineapigs of faeces containing metacyclic trypanosomes, and subsequent recovery of sanguicolous forms from the peripheral blood.

In conclusion, the authors urge that an extensive serological survey be made to confirm the suggested extent of Chagas's disease in Paraíba, and that a plan be put into operation to control the disease by action against the vectors. [The paper contains a considerable amount of data, concisely presented and largely in tabular form.] *N. R. Phillips*

Nussenzweig, V., Nussenzweig, Ruth S., de Freitas, J. L. P., Amato Neto, V., Biancalana, A. & Kloetzel, Judith. Ação de agentes físicos e químicos sôbre o *Trypanosoma cruzi* " in vitro ". [**Action of Physical and Chemical Agents upon** *Trypanosoma cruzi in vitro*] *Hospital.* Rio de Janeiro. 1954, May, v. 45, No. 5, 589–99. [24 refs.] English summary.

In view of the reported transmission of Chagas's disease in the course of blood transfusion in Brazil, the necessity has arisen to devise methods for eliminating *Trypanosoma cruzi* from blood banks. For this purpose a search was made for physical and chemical agents with a trypanocidal effect. The drugs used in these tests were mixed with citrated blood containing the trypanosomes, and left for various periods of time in a refrigerator at 6°C., and their effect upon the flagellates was assessed directly, by microscopical examination, and indirectly, by inoculation of

mice, whose blood was examined for 2 months. In most of the experiments the trypanosomes tested were blood forms from infected mice but in some cases cultures were used, while the haemolytic action of the drugs was studied in blood from blood banks.

It was found that *T. cruzi* kept in blood stored in the refrigerator at 6°C. maintained its infectivity for 21 days, and that after centrifugation for 15 minutes at 3,000 r.p.m. trypanosomes were still present in the plasma, indicating that Chagas's disease could be transmitted with plasma used for transfusion. Among the chemicals, tricresol, hexylresorcinol, Miracil D, pentaquine, mercury bichloride and Merthiolate [thiomessalate] proved to be trypanocidal *in vitro*, but none of them were suitable for treatment of blood banks, either because of their haemolytic action or toxicity. The following drugs had no appreciable trypanocidal effect when tested *in vitro*: methylene blue, toluidene blue, acriflavine hydrochloride, several organic compounds of mercury, Bayer 7602, Nipagin [a hydroxybenzoate], Solustibosan, Spirotrypan, puromycin, Chlorpactin and sodium iodide. *C. A. Hoare*

Vicente Scorza, J., Dagert, Cecilia & Iturriza, L. Exploración de la acción de la Actinomicina C (Sanamycin "Bayer") sobre *Schizotripanum cruzi* y *Leishmania brasiliensis in vitro* y *Leishmania enriettii Trypanosoma venezuelense in vivo*. [**Study of the Action of Actinomycin C (Sanamycin) against** *T. cruzi* **and** *Leishmania braziliensis in vitro* **and** *L. enriettii* **and** *T. venezuelense in vivo*] *Gac. Méd. de Caracas*. 1955, Mar.–Apr., v. 62, Nos. 3/4, 133–43. [11 refs.]

The English summary appended to the paper is as follows:—

"In this work the authors give a summary of information about actinomycin A, B and C; they assay the latter (Sanamycin 'Bayer') against S. cruzi and Leishmania brasiliensis *in vitro*, proving that this substance at D.L. 50 for mice does not prevent the development of S. cruzi in culture. They observe that 0·5 microgrammes are enough to prevent the development of L. brasiliensis in Davis medium. They assay Sanamycin against L. enriettii in guinea-pigs and T. venezuelense in white mice, observing that, though it does not prevent the evolution of the leishmania in the host, it prevents the development of a secondary infection; assayed against T. venezuelense in doses of eight microgrammes, it prolongs the life of the treated animals to twice the time that the evolution of the parasites takes in the control animals."

Bianchini, C. A. **A New Fixing and Staining Technique for** *Trypanosoma cruzi* **in Blood Films.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, June, v. 7, No. 2, 130–33, 7 figs.

It is well known that owing to its fragility *Trypanosoma cruzi* easily breaks up in blood films. To overcome this defect the author has devised a new fixing and staining method, which is described in this paper.

For thin films, a drop of 1 per cent. solution of brilliant cresyl blue in absolute alcohol is placed on a slide, while on the end of another slide a drop of infected blood is taken up, after which it is applied to and rapidly mixed with the drop on the first slide and spread into a film. This is dried in the air, fixed in methyl alcohol for 1 minute and stained by Giemsa's method for 30 minutes.

For thick films the following solution is used: brilliant cresyl blue 1 gm., 40 per cent. formalin 1 ml., acetic acid 0·2 ml., 1 per cent. potassium oxalate in saline 100 ml. A drop of this solution and 2–3 drops of infected blood are placed on a slide side by side, mixed, and spread over an area of 2 cm. in diameter. The slide is left to dry for 15–30 minutes, after which it is immersed in a solution of Giemsa's stain, in which it is left for 30 minutes to be dehaemoglobinized and stained.

The trypanosomes treated by this method preserve their normal appearance and stain well, as shown in an accompanying photomicrograph.

C. A. Hoare

Céspedes, R. & Aguilar, A. Miocarditis chagásica aguda mortal. [**An Acute Fatal Case of Myocarditis in Chagas's Disease**] *Rev. Biologia Trop.* San José, Costa Rica. 1955, July, v. 3, No. 1, 31–41, 11 figs. on 2 pls. [11 refs.]

The English summary appended to the paper is as follows:—

"1) A fatal case is reported of acute Chagas miocarditis in a 17-year-old male, a resident of a suburb of San José C.R.

"2) The etiological diagnosis was not made in the clinic, nor at the macroscopic autopsy.

"3) The principal clinical facts were: an indefinite infectious state of a month's duration, which in the last week changed to a picture of violent cardiac insufficiency, with global cardiomegaly and gallop rhythm, without any sign of valvular disease. The hemogram showed lympho-monocytosis 40%.

"4) The anatomopathologic findings included: signs of chronic pulmonary and abdominal visceral stasis; moderate cardiomegaly (360 gr.), parietal thrombosis in the left ventricle, miocardial flaccidity with dilatation of all the cavities. Acute intense miocarditis; reticular hyperplasia in Peyer's patches, mesenteric ganglia and spleen.

"5) Epidemiologic investigation showed 32 out of 116 dwellings of the neighborhood where the patient lived, to be infested by triatomids, 30% of which were infested with *Trypanosoma cruzi*.

"6) Domestic carriers of *T. cruzi* so far reported from Costa Rica are *Triatoma dimidiata* and *Rhodnius prolixus*.

" 7) Up to April 1954, 20 cases have been reported from Costa Rica of Chagas disease, 3 of which have been fatal."

Meira, J. A., Amato Neto, V., Tartari, J. T. de A. & Sonntag, Ruth. Tratamento de casos agudos da doença de Chagas por meio da puromicina (ex-acromicina). Resultados obtidos. [**Treatment of Acute Cases of Chagas's Disease with Puromycin (ex-Achromycin)**] Reprinted from *Rev. Brasileira Med.* Rio de Janeiro. 1954, Dec., v. 11, No. 12, 829–31. English summary.

The treatment was unsuccessful in all of 5 cases.

Pinotti, M. Contrôle da doença de Chagas no Brasil. [**Control of Chagas's Disease in Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1954, July, v. 6, No. 3, 301–10. [18 refs.] English summary.

Readers of this *Bulletin* will be familiar with the vast amount of work undertaken in the control of Chagas's disease in Brazil by Dr. Pinotti and his staff in the National Malaria Service. This short paper, read at the 5th International Congress of Tropical Medicine at Istanbul in 1953 summarizes the work started in 1950. Certain figures and observations are of special interest. The programme is carried out by the National Malaria Service (a federal organization) and in São Paulo by the Malaria Service of that State.

Up to the end of 1952, 181,438 houses in 24,718 areas in 548 counties were inspected and of 145,180 triatomid bugs collected, 56,780 were examined for *T. cruzi*. The common domestic species in each region of Brazil (with the index of infection with *T. cruzi* in brackets) were as follows:—

T. infestans (35 per cent.), Central and South;
T. sordida (10·8 per cent.), Central and North East;
Panstrongylus megistus (14·3 per cent.), Central and North East;
T. brasiliensis (5·9 per cent.), North East;
T. maculata (4·9 per cent.), North East.

Complement-fixation tests were found to be positive principally in the Centre and South, especially in Minas Gerais and São Paulo. In these States, as well as Goiás, Rio Grande do Sul and Paraná, the disease is a serious problem, with *T. infestans* and *P. megistus* predominating as vectors. Up to the end of 1952, 241,095 houses and their outbuildings were sprayed with BHC at a minimum dose of 500 mgm. gamma isomer per sq. m. In São Paulo, an additional 214,827 were sprayed. One application yearly maintains the triatomids at a low level, but experiments suggest that 2 such applications would be necessary for eradication.

Further research is needed to determine the interval between spraying and the appropriate season. In some heavily infested localities, house spraying with BHC has markedly reduced the number of acute cases of the disease. *H. J. O'D. Burke-Gaffney*

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

Smith, P. A. J. **Long Incubation Period in Leishmaniasis.** [Correspondence.] *Brit. Med. J.* 1955, Nov. 5, 1143.

The author refers to the report by Jopling [this *Bulletin*, 1956, v. 53, 39.] of a long incubation period in kala azar and points out that this may also occur in " leishmaniasis " [evidently cutaneous leishmaniasis]. He then quotes a case seen in London of a man who developed a typical granuloma on the hand, from which Leishman-Donovan bodies were isolated, 3 years after he had left North Africa and Italy.

H. J. O'D. Burke-Gaffney

Cvjetanović, V. O leishmanijazi psa i epidemiološkim vezama izmedu bolesti psa i kala-azara kod ljudi. (Saopćenje o istraživanjima u Dubrovniku i okolici.) [**Leishmaniasis of Dogs and the Epidemiological Relation between Canine Leishmaniasis and Kala Azar in Humans.** (Communication about Investigations in Dubrovnik and its Surroundings)] *Higijena.* Belgrade. 1954, v. 6, Nos. 3/4, 252–60, 2 figs. [11 refs.]

The English summary appended to the paper is as follows:—

" Canine leishmaniasis was investigated and the diagnostic value of formol-gel test proved. Visceral leishmaniasis (Kala-azar) is predominant mostly along the coast, corresponding to the population of sand-flies in this area. Leishmaniasis is primarily a disease of dogs; humans being only secondarily and rarely infected.

" The relation between human and canine cases in the town and district is shown and discussed.

" In spring it is possible to find out all infected dogs, with or without clinical signs using formol-gel test. Thus it is possible to prevent the dogs from being the source of infection by curing or killing them before the invasion of sand-flies takes place in the summer."

See also p. 257, Gaud, Phlébotomes du Maroc. [*Phlebotomus* **Species in Morocco**]

See also p. 164, Vicente Scorza *et al.*, Exploración de la acción de la Actinomicina C (Sanamycin "Bayer") sobre *Schizotripanum cruzi* y *Leishmania brasiliensis in vitro* y *Leishmania enriettii Trypanosoma venezuelense in vivo*. [**Study of the Action of Actinomycin C (Sanamycin) against** *T. cruzi* **and** *Leishmania braziliensis in vitro* **and** *L. enriettii* **and** *T. venezuelense in vivo*]

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

Siennicki, W. & Radziszewska, Danuta. Wiązanie dopełniacza w kierunku duru plamistego z surowicami przysyłanymi na odczyn Widala. [**The Complement-Fixation Test using Rickettsial Antigen with Sera supplied for Widal Test**] *Med. Dośw. i Mikrob.* Warsaw. 1955, v. 7, No. 4, 385–92. [11 refs.]

The English summary appended to the paper is as follows:—

"From July 1954 to March 1955 complement fixation tests (using rickettsial antigen) as well as Weil-Felix tests were made on sera from 1077 persons supplied for Widal tests. 815 persons were Weil-Felix negative and Widal negative or weakly positive (titres from zero to 1:100), 208 persons Weil-Felix weakly positive (titres 1:50) and Widal negative or positive (titres from zero to 1:200), 30 persons Weil-Felix positive (titres 1:100) and Widal negative or positive (titres from zero to 1:200), 25 persons with the same Weil-Felix and Widal titres (1:200 or 1:400) and two persons Weil-Felix positive (1:800 and 1:1600) and Widal weakly positive (1:50).

"The complement fixation test was positive in 31 cases (titres from 1:200 to 1:3200). Nine of these cases were Weil-Felix negative, twelve weakly positive (titres from 1:50 to 1:100) and three positive (titres 1:200, 1:400 and 1:1600). 23 out of these 31 cases were thought to be relapses of previous typhus fever infections. In ten cases the previous attacks occurred 9–20 years earlier, in eight cases 29–40 years earlier."

Giroud, P., Pfister, R., Roger, F. & Dumas, Nicole. Essais sérologiques sur les rickettsioses classiques et les néo-rickettsioses au Soudan. [**Serological Tests for the Classical Rickettsial Diseases and the Neo-Rickettsioses in the French Sudan**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 312–14.

The authors have already reported their findings in a serological survey, in the Upper Volta region, of the antibodies in human and animal sera

for epidemic typhus (ET), murine typhus (MT), boutonneuse fever (BF) and Q fever (QF) [see this *Bulletin*, 1954, v. 51, 365]. The tests now described were carried out in Bamako in the French Sudan; they are referred to merely as serological tests carried out at only one titre [which is not specified]. The results are shown in the table below:

	Number	ET	MT	BF	QF
Africans in general	135	3	1	12	1
African shepherds or butchers	26	3	0	4	0
European patients	7	1	0	2	1
Cattle	5	1	0	2	0
Sheep	17	3	0	5	3

In another series the tests were made only for the antibodies of the rickettsioses regarded as being primarily animal diseases capable of transmission from the animals to man; these are Q fever and neo-rickettsiosis. The latter name has been given by the authors to diseases caused by agents on the border line of the rickettsiae and related to the psittacosis group of organisms [see *ibid.*, 1955, v. 52, 1064]. In 10 African shepherds and 16 cattle the reactions were negative with antigens of both diseases. Among 19 Europeans 2 reacted for Q fever, and of 9 goats 2 reacted for this disease. Reactions with neo-rickettsial antigen occurred in 1 out of 23 "Africans in general" and in 4 of 23 sheep. [No comment is made on the significance of these reactions; they indicate the need for further study of the rickettsial diseases of equatorial Africa.]

John W. D. Megaw

Le Gac, P., Giroud, P., Roger, F. & Dumas, Nicole. Au sujet des infections varicelliformes d'origine rickettsienne. [**Varicelliform Infections of Rickettsial Origin**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 314–16.

Three cases of fever are briefly described from Oubangui in French Equatorial Africa. In each there was a varicelliform eruption but the serological reactions were entirely different. In one case there was a definite fixation reaction with the antigen of *Rickettsia akari*; the reactions with *R. prowazeki*, *R. mooseri* and *R. conori* were negative. There was a slight agglutination reaction with *R. burneti*. The agglutination and complement-fixation reactions with the neo-rickettsial antigens X.14 and V.14 were negative but with the psittacosis T.13 antigen they were weakly positive. In the second case the reactions with *R. prowazeki* and *R. conori* were positive; they were negative with *R. mooseri*, *R. burneti* and *R. akari*. With agglutination and complement-fixation tests the reactions were negative against the neo-rickettsial antigens.

In the third case the reactions with all the above antigens were completely negative a month after defervescence.

The authors conclude that there are probably numerous different diseases in which varicelliform eruptions occur and that the study of these should be taken up and should not be confined to rickettsialpox.

John W. D. Megaw

Neva, F. A. & Snyder, J. C. **Studies on the Toxicity of Typhus Rickettsiae. III. Observations on the Mechanism of Toxic Death in White Mice and White Rats.** *J. Infect. Dis.* 1955, July–Aug., v. 97, No. 1, 73–87, 6 figs. [22 refs.]

This is a study of the effects of intravenous inoculation of the toxins of viable *Rickettsia prowazeki* and *R. mooseri* into white rats and white mice. Soon after the inoculation there was a progressive rise in the specific gravity of the blood and a corresponding rise in the haematocrit readings. In spite of the diminution in the volume of the blood plasma the systolic blood pressure remained almost normal till just before the death of the animals when it suddenly fell. The loss of plasma was attributed to increased permeability of the capillaries caused by direct injury to the endothelial cells. The administration, during 2–4 days before inoculation, of relatively large doses of the broad-spectrum antibiotics had no protective effect.

John W. D. Megaw

Suzuki, T. **Studies on the Bionomics and Chemical Control of Tsutsugamushi (Scrub-Typhus Mites). Part II.** *Trombicula scutellaris* **Nagayo** *et al.* **in Southern Kanto of Japan.** *Japanese J. Exper. Med.* 1954, Aug., v. 24, No. 4, 181–97, 2 figs. [27 refs.]

This paper deals with the bionomics and chemical control of *Trombicula scutellaris* in a parallel fashion to that adopted in the previous paper [this *Bulletin*, 1955, v. 52, 621] for *T. akamushi*.

Larvae were collected on black bakelite plates, as before, and it was noticed that the maximum number of mites per plate was reached in 5 to 10 minutes, declining thereafter. The rate of movement of unengorged larvae was found to be on average slightly slower than that found for *T. akamushi* previously. As in the latter species, *T. scutellaris* also exhibits a slight negative geotaxis.

Temperatures of 43·48°C. (average) were found to be fatal [the time of exposure to high temperatures, however, is not stated]. Larvae were found to survive in a refrigerator for over 60 days at a temperature of 0–2°C. The author suggests that this may indicate the occurrence of larval overwintering in the field.

T. scutellaris was found to have a much more extensive distribution than *T. akamushi* (the latter being confined to grassy fields lining specific rivers in North-West Honshu). *T. scutellaris* was most commonly encountered in moist habitats—woods, swamps, and bushy vegetation, and was rare in urban and suburban localities.

For personal protection by skin application benzyl benzoate and dimethyl phthalate were effective; for impregnation of clothing lindane proved best.

Experiments on area control with 1 per cent. lindane dust applied at a rate of between 0·5 lb. and 5 lb. per acre achieved complete eradication, or good control, for periods of at least 4 months. *D. M. Minter*

Stoker, M. G. P., Brown, R. D., Kett, F. J. L., Collings, P. C. & Marmion, B. P. **Q Fever in Britain: Isolation of *Rickettsia burneti* from Placenta and Wool of Sheep in an Endemic Area.** *J. Hygiene.* 1955, Sept., v. 53, No. 3, 313–21. [12 refs.]

This paper contains a description of the isolation for the first time in England of *Rickettsia burneti* from sheep. Two of the present authors, with other workers, have already published serological evidence of the presence of Q fever among sheep in the Romney Marsh in Kent and of the transmission of infection from these sheep to man [see this *Bulletin*, 1954, v. 51, 907]. In the present investigation attempts were made to isolate *R. burneti* from the placenta of each of 105 ewes from a flock in which among 95 sheep tested in the previous year 32 (33·7 per cent.) had given positive complement-fixation reactions at titres of 1 in 10 to 1 in 80. From 2 of the placentas *R. burneti* was recovered about 7 months after the fixation tests had been carried out, and from the more heavily infected of the ewes, wool tags taken from the perineum also yielded a strain of the organism. No infection was found in any of the wool tags from the other 93 sheep of this flock examined within 24 hours of lambing. Towards the end of the lambing season 25 random samples of faeces of the flock were examined but no infection could be isolated. In July 1954, after the end of the lambing season, sera of 115 ewes of the flock were tested by the complement-fixation reaction and in striking contrast to the results observed 10 months earlier only 2 sheep (1·7 per cent.) reacted at 1 in 10.

The remarkably low rate of recovery of infection in 1954 was in keeping with the considerable fall in the proportion of reacting sheep in that year.

Another flock of sheep, about 4 miles distant, was investigated in the same way. A shepherd working with the flock for the first time developed Q fever in June 1953. At that time among 143 sheep tested 11 (7·7 per cent.) reacted at 1 in 10 to 1 in 80 with the fixation test. In July 1954, after the examination of 194 placentas and 25 samples of faeces with negative results, sera of 200 sheep were tested and only 2 reacted at 1 in 10.

The technical methods employed in the study are given in detail; they will serve as a guide to other workers undertaking a similar study.

John W. D. Megaw

Stoker, M. G. P. & Marmion, B. P. **Q Fever in Britain: Isolation of *Rickettsia burneti* from the Tick *Haemaphysalis punctata*.** *J. Hygiene.* 1955, Sept., v. 53, No. 3, 322–7. [10 refs.]

This is a description of the first definite isolation in Great Britain of *Rickettsia burneti* from naturally infected ticks. During, and soon after, the lambing season of 1954 it was possible to collect 1,762 ticks, identified as *Haemaphysalis punctata*, from the flock of sheep from which 2 strains of *R. burneti* were isolated as stated in the preceding abstract. The ticks were divided into 25 lots classified according to their sources and stages of development, and ranging in number from 16 to 371 specimens. The first step was to wash the ticks in 8 ml. of penicillin horse serum broth. The washings were kept for separate examination to find whether the surface of the ticks had become contaminated with infective material from the soiled tags of wool on the perineal region of the sheep. The ticks were then ground up with sand and 8 ml. of fresh broth of the same kind. In each case 2 ml. of the supernatant fluid were used to inoculate guineapigs intraperitoneally, and 42 days later the animals' sera were tested for complement-fixing antibodies.

R. burneti was isolated from 2 of the tick pools, one of which consisted of 94 unengorged ticks from sheep which lambed between 7 and 13 April. This pool included ticks found on a sheep from whose placenta and wool tags *R. burneti* had been isolated. The tick washings and tissue suspensions were infected at low titres and the infectivity of the washings was higher than that of the tick-tissue suspension, so it was impossible to rule out contamination from the wool. The other pool consisted of 371 unengorged ticks collected from sheep and lambs between 14 May and 11 June. Only 5 sheep lambed during this period and none of them was found to excrete *R. burneti*. The tissue suspensions were highly infective and the tick washings were non-infective so it appeared that the rickettsiae were multiplying in the tick or ticks. This strain was cultivated in yolk sacs inoculated with spleen suspensions from an infected guineapig; antigen prepared from the culture reacted strongly in complement-fixation tests of serum from a rabbit immunized with the Nine Mile strain of *R. burneti*.

From 7 flocks of sheep in the neighbourhood 104 specimens of *H. punctata* were collected and tested, but with negative results.

The problem of the possible transmission of *R. burneti* by ticks is discussed and the conclusion reached is that although many species of ticks have been found infected with the organism in other countries, and although various species of ticks have been found capable of transmitting infection between experimental animals and also from generation to generation of ticks, it is not safe to assume that the finding of *R. burneti* in ticks from Kentish sheep necessarily indicates that transmission of infection by the ticks has occurred among the sheep.

H. punctata in Britain has a strictly limited distribution which coincides with the area in Kent in which Q fever is common among cattle, sheep and human beings.

Ixodes ricinus is the only tick which is common and widespread in Great Britain. Attempts have been made in Scotland, Cumberland and Devon to isolate *R. burneti* from this tick, without success, but the ticks tested did not come from animals known to be infected with Q fever.

The authors emphasize the importance of the precautions they have taken to exclude the possibility of external contamination of the body of ticks in experiments for the isolation of *R. burneti* from tick suspensions; they suggest that some of the reported isolations from various species of ticks may have been of doubtful significance because of lack of this precaution.

The coincidence of the distribution of *H. punctata* with an area of Q fever infection is not regarded by the authors as evidence that the tick was acting as a transmitter of infection among the sheep. [It does, however, support the view that occasional transmission by ticks may possibly be a factor in the permanent maintenance of the life cycle of *R. burneti.*] *John W. D. Megaw*

Syrůček, L., Raška, K., Havlík, O., Lím, D. & Manych, J., with the assistance of H. Ženíšková, A. Vejtrubová & M. Brůčková. Isolace Coxielly burneti z volně žijících ptaků v Československu. Q. horečka —5. sdělení. [**Isolation of *Rickettsia burneti* from Non-Domesticated Birds in Czechoslovakia**] *Československ. Hyg., Epidemiol., Mikrobiol., Imunol.* Prague. 1955, v. 4, No. 4, 199–202, 1 fig. on pl. [11 refs.] English summary.

In an investigation of the epidemiology of Q fever in Czechoslovakia the causative organism was isolated in 2 of 35 attempts by the inoculation of guineapigs with suspensions of liver and spleen from wild birds (redstart, wagtail) caught in the neighbourhood of a focus of the disease. *D. J. Bauer*

Syrůček, L., with the assistance of A. Vejtrubová & M. Brůčková. Experimentální infekce kura domácího Coxiellou burneti. Q. horečka—4. sdělení. [**Experimental Infection of Poultry by *Rickettsia burneti*. Q Fever—IV**] *Československ. Hyg., Epidemiol., Mikrobiol., Imunol.* Prague. 1955, v. 4, No. 4, 196–8. English summary.

The authors have previously demonstrated the presence of Q fever complement-fixing antibody in the sera of chickens from a focus of the disease in Czechoslovakia [this *Bulletin*, 1955, v. 52, 757, 758]. In the present work 4 hens were inoculated intraperitoneally with a suspension of yolk sac infected with *Rickettsia burneti*; a short pyrexial illness

followed after 2 days, with loss of weight of 100–400 gm. One bird killed after 14 days showed non-specific bronchopneumonia. The others were killed after 28 days; attempts to find *R. burneti* in preparations of spleen and liver were unsuccessful, but the organisms could be recovered from all 4 birds by the inoculation of guineapigs with suspensions of spleen or kidneys. The infection of the birds was not followed by the development of complement-fixing antibody. *D. J. Bauer*

Gadjusek, D. C. & Bahmanyar, M. Sur la Q fever en Iran. [**Q Fever in Iran**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 1, 31–3.

The authors report the results of complement-fixation tests on 102 sera from healthy persons in 3 villages in Iran: 40 were from Kamard, a small mountain village 40 km. east of Tehran, 40 from Nardine, an isolated mountain village about half way between Tehran and Meshed and 22 from Taïabad on the border of Afghanistan.

In the Nardine series, 4 sera were positive at titres of 1 in 10, 1 in 10, 1 in 20 and 1 in 20: in the Taïabad series, 4 were positive at 1 in 5; and all sera from Kamard were negative.

The 2 sera from Nardine with the titre of 1 in 20 were from children of 5 and 6 years, and a third was from a child of 14. All the other positive sera were from adults. None of these persons had ever left their districts. [See also Rafyi and Maghami, this *Bulletin*, 1955, v. 52, 890.] *H. J. O'D. Burke-Gaffney*

Quintin, P., Chambon, L. & Desnues, P. Une petite épidémie de fièvre Q observée à bord de navires de la Marine Nationale à Saïgon. [**A small Epidemic of Q Fever on board Ships of the French Navy at Saigon**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 316–20.

Between June 15 and July 6, 1954, the authors saw 25 cases of Q fever among the crews of ships of the French Navy at Saigon. The clinical features conformed to those of the pulmonary type of this disease and the diagnosis was confirmed by positive reactions in micro-agglutination tests with *Rickettsia burneti* antigens; the only patient who did not react at a significant titre was tested on the 4th day of the illness. Twelve of the patients were living on board the *Montcalm*; one of these was attacked only 3 days after the arrival of the ship from France. The other cases occurred in various ships in the naval harbour and it is mentioned that some of these had been engaged in transporting cattle and troops along the coast of Indo-China. This epidemic is the first published record of the occurrence of Q fever in Vietnam, but one of the authors is reported as having made a retrospective diagnosis of a case which occurred in another of the ships based on Saigon 8 months earlier.

The origin of the epidemic could not be determined and the epidemiological features mentioned in the paper throw little light on the subject; the occurrence of a case on the *Montcalm* 3 days after arrival suggests that the infection originated on board that ship but no mention is made of the presence of domestic animals or of any articles among the cargo which might have been sources of infected dust. *John W. D. Megaw*

Moynihan, I. W., Tailyour, J. M. & Rice, Christine E. **Q Fever: a Survey to determine if *Coxiella burneti* is present in Milk from Cows in the Fraser Valley.** *Canadian J. Comp. Med.* 1955, Sept., v. 19, No. 9, 272–5, 1 fig. [13 refs.]

"Pooled raw-milk samples originating from cattle on 56 widely separated farms in the Fraser Valley failed to reveal the presence of *Coxiella burneti*. This observation is based on the results of guineapig inoculation tests which involved both observation of the body temperatures of the guineapigs and serological tests conducted on their blood."

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

Reagan, R. L., Chang, S. & Brueckner, A. L. **Study by Electron Microscopy of Erythrocytes from Cave Bats (*Myotus lucifugus*) infected intraperitoneally with Yellow Fever Virus (17D Strain).** *Texas Reports on Biol. & Med.* 1955, v. 13, No. 3, 470–74, 3 figs.

"In a previous paper (Reagan, *et al.*, 1953), we described this purified 17D yellow fever strain to be round with a slightly irregular contour and with a diameter of 50 to 55 mu and to resemble the virus of measles (morbilli) described by Reagan, *et al.*, 1952. The virus in or on the erythrocyte in this experiment from the 24 and 48 hour bleeding intervals show the virus particles to resemble the original purified 17D virus described above. The 24 and 48 hour bleedings produced an encephalitis in Swiss mice injected intracerebrally. The other bleedings from the control and infected group showed no virus-like particles on or in the erythrocyte, and their suspensions were not infective for Swiss mice inoculated intracerebrally."

[See this *Bulletin*, 1954, v. 51, 372.]

Komp, W. H. W. **The Oviposition of *Haemagogus equinus* in Nature (Diptera, Culicidae).** *Mosquito News.* 1955, Sept., v. 15, No. 3, 163–4.

During a collecting trip in the Panama Canal Zone in June 1954 the author observed a female *Haemagogus* laying eggs in the damp moss surrounding a hole in the trunk of a mango tree. The mosquito made no preliminary probing movements with the tip of the abdomen but placed the eggs at random on the moss above the water-line.

The mosquito and the moss containing 6 eggs were taken to the laboratory where the captured female died and 3 of the eggs produced 1 male and 2 females. All the material was identified as *Haemagogus equinus.* *H. S. Leeson*

RABIES

Schmidt-Lange. Über die Tollwut. [**Rabies**] *Desinfektion u. Gesundheitswesen.* 1955, Oct., v. 47, No. 10, 149–53.

This paper is based on a lecture given by the author. It begins with a short historical account and some particulars of the causative virus. The epidemiology of the disease is described at some length in particular connexion with the recent increase in the incidence of rabies in Southern Germany [this *Bulletin*, 1954, v. 51, 568].

Reference is made to the widespread infection of animals and birds of many species, the variable incubation period of the disease, the diagnosis and official methods of control. There is included a list of the different methods of protective inoculation devised by Pasteur, Högyes, Phillips, Fermi, Semple, Hempt and Van Stockum. Some of the statistics of incidence in man and of the mortality in inoculated and uninoculated persons published by the Robert Koch Institute report for 1952 [*ibid.*, 1955, v. 52, 356] are quoted. *M. E. Delafield*

Kirk, R., Haseeb, M. A. & McKinnon, R. M. **Observations on Rabies in the Sudan.** *Sudan Med. J.* 1955, Apr., v. 1, No. 3, 5–26. [21 refs.]

In this paper the authors record their observations on rabies in the Sudan during the 15-year period 1935–1949. The subject-matter is presented under 4 headings: animal rabies, human rabies, antirabic vaccination, and notes on the Khartoum strain of Paris virus.

As regards animal rabies practically nothing is known about the incidence of the infection in animals other than domestic animals.

During the period under review 2,591 animal brains, sent from all parts of the Sudan, were examined at the Stack Medical Research Laboratories in Khartoum; 786 (30·33 per cent.) were found to contain Negri bodies; of the 786 positive brains 638 (81·17 per cent.) were from dogs and 77 (9·80 per cent.) from donkeys, while those from other animals constituted only a small proportion of the total. The epidemiological picture illustrated by these findings is that of rabies associated with man in settled and nomadic communities and maintained principally in domestic dogs.

Between 1935 and 1949 155 cases of human rabies were reported and in all but 2 of these the biting animal from which the infection derived was the dog. Of these 155 cases 99 occurred among persons who had received no specific treatment, while 56 (0·73 per cent.) occurred among the 7,642 persons who had been given the vaccine prepared at the Stack Laboratories, namely, a 4 per cent. tissue suspension in 0·5 per cent. phenol saline of emulsified brain from sheep inoculated with fixed rabies virus. Although decentralization of treatment is practised, with a recommended dosage of 14 daily injections, each of 5 ml. given intramuscularly, only 24 of the 56 patients had received the full course of injections and of these 9, who died of rabies 14 or more days after the completion of treatment, may conventionally be classed as failures of treatment. There was no case of paralytic accident among the 7,642 persons treated.

The authors conclude their observations by indicating the results of their experimental work with the Khartoum strain of fixed virus—a strain derived from the Pasteur Institute (Paris) fixed virus. These results show, *inter alia*, that the virus, although absolutely fixed as regards the regularity of its incubation period in sheep and rabbits after subdural inoculation, is capable of infecting rats, mice, rabbits and guineapigs by the subcutaneous or intramuscular routes with comparative regularity.

G. Stuart

van Waveren, G. M. Rabies Laboratoriumdiagnostiek en vaccinatie bij dieren. [**Laboratory Diagnosis and Vaccination against Rabies in Animals**] *Tijdschr. v. Diergeneesk.* 1955, Oct., v. 80, Special No., 961–77, 2 graphs. [36 refs.] English summary.

Ahuja, M. L. & Suri, J. C. **Antirabies Treatment.** *Indian J. Med. Res.* 1955, July, v. 43, No. 3, 523–9.

This paper records the results of experiments devised to ascertain the value of the following methods of treatment in the prevention of rabies: (i) cauterization alone; (ii) cauterization followed by antirabies vaccination; and (iii) antirabies hyperimmune serum as a local and general treatment, with and without the administration of antirabies vaccine. In these investigations the experimental animals employed were guineapigs, which were infected on the exposed surface of the gluteal muscle

by means of a rotary vaccinating lancet dipped in a 20 per cent. suspension of street rabies virus material.

As regards (i) it emerged that, while cauterization of the infected wounds with corrosives such as carbolic or nitric acid within 4 hours of infection was of considerable value in preventing the development of rabies, application of non-corrosives such as methylated spirit or the detergent Cetavlon (cetyltrimethyl-ammonium bromide) in 1 per cent. solution under the same conditions was much less effective. Thus the percentage mortality following local treatment with carbolic acid, nitric acid, methylated spirit and Cetavlon was, respectively, 36, 30, 80 and 80.

As regards (ii) it was found that cauterization of wounds with carbolic acid or nitric acid 4 hours after infection with street virus of high virulence, followed by a course of 5 per cent. Semple-type vaccine (1·5 ml. intraperitoneally on each of 6 successive days), effected a reduction in mortality from 100 per cent. in untreated animals to 27 per cent. and 40 per cent., respectively, in animals treated with carbolic acid or nitric acid plus vaccine. Again, animals treated with nitric acid or carbolic acid plus vaccine 24 hours after infection showed a mortality rate of 40 per cent., compared with the rate of 100 per cent. in untreated animals and 60 per cent. in animals treated with vaccine alone.

As regards (iii), when use was made of hyperimmune serum with a potency equivalent to approximately one million LD 50 guineapig doses, it was shown: (a) that topical application of 0·5 ml. plus infiltration of 1·5 ml. into the site of the wound afforded very limited protection, while intraperitoneal injection of 1·5 ml. within 24 hours of infection, although of some value, gave much less protection than that achieved by vaccine therapy alone; and (b) that when serum was administered by the routes and in the quantities indicated above and was followed 24 hours later by a course of Semple-type vaccine, the mortality ratio in untreated, vaccine-treated and vaccine-*cum*-serum-treated animals was of the order of 93 : 41 : 30, respectively. [For previous studies by the authors, see this *Bulletin*, 1955, v. 52, 151.] *G. Stuart*

Gispen, R. Het vraagstuk van de behandeling tegen rabies bij de mens. [**The Problem of Anti-Rabies Treatment in Man**] *Tijdschr. v. Diergeneesk.* 1955, Oct., v. 80, Special No., 945–60. [43 refs.]

The English summary appended to the paper is as follows:—

"The anti-rabies treatment of man depends on methods for rapid immunisation with minimal risk of neuroparalytic accidents. These demands are contradictory, as an intensive treatment with vaccine is required for the immunisation whereas a light treatment is essential for the prevention of neuroparalysis. This dilemma has not been removed by the introduction of killed vaccines. The partial loss of antigen due to the chemical inactivation even necessitates a compensation by concentrating the vaccine. Inactivation by means of ultra violet radiation

does not involve considerable loss of antigen and should therefore be preferred.

"The immunizing value of lyophilized U.V. vaccine in potency tests is much the same as that of an attenuated Hoegyes-Phillips vaccine. The U.V. vaccine, however, is superior as to the greater stability of its antigen.

"The chance of neuroparalytic accidents after treatment with U.V. vaccines is unknown. The elimination of this risk is still a problem, whatever the choice of vaccine may be. The solution might be found in the adaptation of the virus to myelin-free organs, after the example of the Flury strain. Unfortunately, the Flury vaccine as such cannot be recommended for application in man. The antigenic potency in man should be raised by selection of virus strains, whereas reactions on account of egg-hypersensitivity in man should be avoided by purification of the egg-vaccine or adaptation of the virus to other tissues."

Ramon, G. Sur la lutte contre la rage. [**The Campaign against Rabies**] *Bull. Acad. Nat. Méd.* 1955, v. 139, Nos. 5/6, 109–14. [Refs. in footnotes.]

The author begins with some observations on the theory of immunity in rabies and then discusses the practical problems of control. During the past few years there has occurred in various parts of the world a recrudescence of animal rabies, with a consequential increase in the incidence of rabies in man. In the present paper the author details the several generally accepted measures of rabies control, the strict application and continued enforcement of which have led to the eradication of the disease from territories where once it was prevalent and to the permanent freedom of such territories from reinfection. In countries such as the United Kingdom, Australia and New Zealand, where quarantine measures for imported dogs and cats are feasible, there is no doubt that such measures are the most effective means of keeping these countries free from rabies.

In countries where the disease is enzootic, eradication can in most cases be accomplished by concentrating attention on the dog and applying such well recognized measures as registration, licensing and taxation of dogs, the elimination of stray animals and the restraint of dogs while a control campaign is under way; in countries where a wild life reservoir of the disease exists a reduction in the numbers of those species affected must also be undertaken. In campaigns against rabies the value of periodic, compulsory, prophylactic immunization of dogs with an effective virus vaccine is fully admitted, but such immunization is to be regarded as an adjunct to, and never as a substitute for, general measures of control. In support of this view the author points out that in countries now free of rabies, *e.g.*, Belgium, France, Norway, Sweden and Switzerland, the systematic anti-rabies vaccination of dogs has not been practised, whereas in Israel, where such vaccination was considered to be the decisive factor

in achieving a low incidence of the disease, there was a recrudescence of rabies in 1954 after the control of stray dogs had been temporarily relaxed.

Finally, countries with adjoining land boundaries and where rabies is already present in domestic or wild animals are strongly urged, in their common interest, to coordinate their measures of control. LEPINE discussed the vaccination of dogs and referred to the Flury vaccine. MARTEL gave figures and described measures relating to the control of rabies in the Paris area. *G. Stuart*

RAMON, G. La lutte contre la rage. [**The Campaign against Rabies**] *Bull. Acad. Nat. Méd.* 1955, v. 139, Nos. 7/8, 149–51.

[Experience has shown that in most instances complete eradication of rabies can be accomplished and a state of freedom from the disease maintained by concentrating attention on the dog. By quarantine measures, destruction of stray dogs, and now with the aid of canine vaccination, systematically applied, the natural trend of the disease towards self-limitation can be encouraged. During the past decade or so the efficacy of both living and killed virus vaccines in canine prophylaxis has been amply demonstrated by the results obtained, not only from carefully controlled and statistically significant laboratory experiments, but also from the extensive field use of such vaccines in countries faced with the problem of enzootic rabies. That it is difficult, well-nigh impossible, to evaluate precisely the rôle played by canine prophylaxis in dealing with this problem becomes evident when consideration is given to the following observations made by the author.]

Belgium, France, Great Britain, Ireland, Norway, the Netherlands, Sweden and Switzerland have succeeded in eliminating rabies and in preserving their territories free from that disease without the aid of canine vaccination.

In the United States, where canine vaccination has long been practised, rabies continues to be highly prevalent and shows no signs of decreasing: there were 5,266 cases of canine rabies in 1952 and 5,688 in 1953. Other countries where, despite canine vaccination, rabies remains prevalent are Algeria, Belgian Congo, Italy and Spain.

In Israel, where the compulsory vaccination of dogs begun in 1951 was regarded as the principal factor in eliminating rabies, there was a recrudescence of rabies in the first 6 months of 1954 following a temporary relaxation of stray-dog control.

In Hungary, where in addition to the compulsory prophylactic vaccination of dogs with a living fixed-virus vaccine, the ordinary measures of sanitary control have been continuously and concurrently practised, rabies has been successfully combated.

In the author's view canine vaccination has not been shown to be capable *per se* of eradicating rabies; it can obviously have no effect on animals which, in times of epizootic, constitute the wild life reservoir

of the disease; it must still be regarded as subsidiary and of secondary importance to other methods of rabies control—methods which, unaided, have proved, when strictly applied, able to eliminate rabies as a public-health and veterinary problem. *G. Stuart*

VAN KEULEN, A. Rabies: epidemiologie, bestrijdingsmaatregelen en medisch-diergeneeskundige samenwerking. [**Medical and Veterinary Cooperation in the Epidemiology and Control of Rabies**] *Tijdschr. v. Diergeneesk.* 1955, Oct., v. 80, Special No., 978–1001, 7 graphs & 6 maps. [19 refs.] English summary.

D'SILVA, C. B. & MENGI, D. L. **A 'Single Dose' Rabies Vaccine for Dogs.** *Indian J. Med. Res.* 1955, July, v. 43, No. 3, 531–8. [13 refs.]

"1. The preparation of a fully inactivated phenolized 20 per cent fixed virus sheep brain vaccine in distilled water, suitable for use as a 'single shot' prophylactic treatment for dogs is described.

"2. The vaccine satisfies the potency test in use.

"3. The vaccine may be suitable for use in the treatment of dogs, already exposed to the risk of rabies infection, and can be made available at a quarter of the price of the 'repeated dose' course of treatment now supplied."

CASTAGNOLI, B. & ORFEI, Z. Controllo su cavia del potere immunizzante del vaccino antirabico. [**Immunizing Power of Anti-Rabies Vaccine, tested on the Rabbit**] *Rendiconti Istituto Superiore di Sanità.* Rome. 1955, v. 18, Pt. 6, 419–25. [14 refs.] English summary (8 lines).

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

HUSSEIN, A. G. **Changes in the Epidemiology of Plague in Egypt, 1899–1951.** *Bull. World Health Organization.* Geneva. 1955, v. 13, No. 1, 27–48, 4 figs.

This is a history of the epidemiology of plague in Egypt from the year 1899—when the disease reappeared in the region after an absence of more than 50 years—till 1947 which was the last year in which any cases were notified. Alexandria and Port Said were the first places attacked in 1899 and 1900 respectively. From these foci the disease spread primarily by water-borne traffic along the rivers and canals or along the sea coast

till the whole country was invaded. From 1931 the incidence tended to diminish and by 1941 and 1942 respectively the numbers of cases were 14 and 15, so it seemed likely that the disease was disappearing spontaneously as had happened in previous pandemics. But in 1943 and the following 4 years outbreaks occurred in the ports of Suez, Port Said, Ismalia and Alexandria; these were associated with the disturbed conditions caused by the war, especially the great volume of water-borne traffic. In 1941 the author became responsible for the introduction of measures for the control of rats in river craft for the protection of the country from the spread of infection from the Suez Canal zone; he states that till 1945 not a single case of plague was reported from the inland areas. In 1947 there were 15 in Alexandria; these were the only cases reported in that year in Egypt and since then the country has been entirely free from the disease.

DDT was first used for plague control in 1946 in Alexandria, Suez, Port Said and Hamman which were the only persisting foci of infection. In the same year the whole population of Egypt was dusted with DDT for the control of relapsing fever with the result that the gradual reduction of the flea population which had already been occurring was sharply accentuated.

The paper contains a great deal of information on the history of plague in Egypt during the recent pandemic. The author is confident that the disease has been eradicated from the country and that if infection should again be introduced effective control by DDT will be easy.

John W. D. Megaw

Fukumi, H., Kaneko, H. & Sayama, E. **Antigenic Substance of** *Pasteurella pestis* **concerning Hemagglutination.** *Japanese J. Med. Sci. & Biol.* 1954, Dec., v. 7, No. 6, 621–9, 1 fig.

Experiments are described which were intended to throw light on the nature of the antigen concerned in sensitizing erythrocytes so as to make them agglutinable by serum containing antibodies of *Pasteurella pestis*. This antigen was extracted from cultures of *P. pestis* and was found to be "a certain kind of polysaccharide which is fairly heat-stable": its nitrogen content was, however, somewhat higher than that of the usual polysaccharides. Details of the method of extracting the antigen are given in the paper.

John W. D. Megaw

Kartman, L. & Lonergan, R. P. **Wild-Rodent-Flea Control in Rural Areas of an Enzootic Plague Region in Hawaii. A Preliminary Investigation of Methods.** *Bull. World Health Organization.* Geneva. 1955, v. 13, No. 1, 49–68, 6 figs. (2 on 4 pls.). [24 refs.]

Two interesting contrivances are described which promise to be useful in controlling the fleas of wild rodents in areas where wild-rodent plague exists as an enzootic disease. The more successful of these is named a

"metal hood-type DDT bait-box". It consists of a box made of aluminium sheeting or tin-plate about 20 inches long, 7 inches wide and 5 inches high. Both ends are open except that just inside each a flat sack of 20 × 20 mesh scrim netting filled with 10 per cent. DDT powder is suspended in such a way as to form a screen against which the rat has to brush when entering the box to reach the bait which is placed on a container on the floor of the box. When entering and leaving the box the rat becomes dusted with the powder both on the back and on the belly so that it carries a certain amount of DDT to its burrow.

In the area on the coast of Hawaii where the bait-box was tested the flea index was very low but the diminution in the number of *Xenopsylla* fleas within a period of 2 months suggested that it might be possible to reduce the index to a level at which transmission of plague among the wild rodents would cease to occur.

The authors point out that the bait-boxes can be used for rat control at the same time as for flea control, by using Warfarin-poisoned bait. [A combined operation on these lines would in most cases be desirable; it would eliminate the risk from survival of infected fleas on rats killed by quick-acting poisons, or caught in traps, while retaining the obvious economic and public-health advantages of rat destruction. Inexpensive modifications of the bait-boxes could easily be made with locally available materials and the application of the principle to the control of domestic rodents and their fleas deserves consideration.] *John W. D. Megaw*

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Pollitzer, R., in collaboration with W. Burrows. **Cholera Studies. 4. Problems in Immunology.** *Bull. World Health Organization.* Geneva. 1955, v. 12, No. 6, 945–1107. [Numerous refs.]

In this fourth part of the Memoir which extends to 160 pages the authors have brought together all the relative information on the aspects of the cholera vibrio relating to immunology which is contained in a widely scattered literature dating back almost to the original discovery of the vibrio. The successive studies on each aspect are set out in detail with full documentation, and some comment. Sections are included on toxin production, virulence, the antigenic structure of *V. cholerae*, its serological reactions and natural immunity and immunity produced by vaccines. Subjects are indicated which are to some extent controversial or require further investigation: these include the nature of the cholera

endotoxin, virulence and its determination, immuno-chemistry, the validity of certain antigens of the vibrio which have been described, antigenic stability and others. The record will be of permanent value to all workers on cholera. [For previous parts, see this *Bulletin*, 1954, v. 51, 1154; 1955, v. 52, 769, 1192.] *J. Taylor*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Buonomini, G. & Ricciardi, M. L. Osservazioni sulla coltivazione di *E. histolytica*. [**Observations on the Cultivation of** *Entamoeba histolytica*] *Acta Med. Italica*. 1955, Mar., v. 10, No. 3, 57–63, 1 fig. English summary (6 lines).

The English summary appended to the paper is as follows:—

"The Authors have described in details the fundamental techniques for *E. histolytica* culture.

"After a comparative test of culture media most commonly used, the attention is being drawn to the modified Boeck-Drbolhav with suggestion to use it systematically for the routine laboratory use."

Kun, E., Bradin, J. L., Jr. & Dechary, J. M. **Effect of Metabolic Inhibitors on Production of CO_2 and H_2S by** *Endamoeba histolytica*. *Proc. Soc. Exper. Biol. & Med.* 1955, Aug.–Sept., v. 89, No. 4, 604–7. [14 refs.]

"The *in vitro* effects of several groups of compounds were tested on the rate of CO_2 and H_2S evolution, catalyzed by enzyme systems of *E. histolytica*. Since the mechanism of the enzymatic reduction of S to H_2S, a reaction which is coupled with the anaerobic oxidation of sugars in this protozoon, has been previously elucidated, it was possible to classify inhibitors on the basis of their primary point of attack. Certain antibiotics were found to interfere with the S reducing enzyme system, while compounds which form metal ion complexes inhibit both CO_2 and H_2S evolution to an equal extent. Arsenate and methylene blue on the other hand inhibit primarily CO_2 evolution (the decarboxylation of pyruvate). Certain heterocyclin N containing compounds (e.g., 2, 3-diaminophenazine), which can trap HS° and also form complexes with metal ions were found to be the most potent inhibitors of enzyme systems of *E. histolytica*. The metabolic reactions which were investigated are

specific for this protozoon, therefore inhibitor studies on these enzyme systems are considered to be the biochemical basis of chemotherapy of amebiasis."

Norman, Lois & Brooke, M. M. **The Effectiveness of the PVA-Fixative Technique in revealing Intestinal Amebae in Diagnostic Cultures.** *Amer. J. Trop. Med. & Hyg.* 1955, May, v. 4, No. 3, 479–82.

In the Communicable Diseases Centre of the U.S. Department of Health, the examination of stained films of faecal cultures, preserved with polyvinyl alchohol [PVA] fixative, is used as a routine method for the diagnosis of amoebic infections, especially with *Entamoeba histolytica*. In order to assess the effectiveness of this method, it was compared with the results obtained by the examination of fresh smear preparations of such cultures.

For this purpose 439 specimens of stools from 412 persons were cultivated in duplicate in modified Boeck-Drbohlav medium without serum, and preparations were made from sediments of the first subculture after incubation for 48 hours at 37°C. The stained smears were prepared by mixing about 1 ml. of the sediment with twice or thrice its volume of PVA-fixative and allowing it to settle overnight, after which 2–3 drops of the fixed material were spread on a slide, dried for 12–24 hours at 37°C. and stained with Heidenhain's iron haematoxylin. The fresh and stained preparations from the same culture tubes were examined for the presence and identity of amoebic trophozoites, and the results obtained by the two diagnostic methods were compared. In a total of 878 faecal cultures, amoebic infections (*Entamoeba histolytica*, *E. coli*, *Endolimax*, *Iodamoeba*, *Dientamoeba*) were detected in 391 preparations examined by both methods; of these 366 (94 per cent.) were identified in the stained smears and 212 (56 per cent.) in the fresh smears.

It was thus shown that, in the parasitological diagnosis of amoebic infections by the cultural method, the results obtained from examination of smears fixed with PVA and stained with iron haematoxylin are superior to those produced from examination of fresh preparations.

C. A. Hoare

Ray, H. N. & Chuttani, H. K. **Provocative Emetine in Diagnosis of Amoebiasis.** [Correspondence.] *Brit. Med. J.* 1955, Nov. 19, 1255.

Hill [this *Bulletin*, 1947, v. 44, 87], Brown [*ibid.*, 1947, v. 44, 314] and others have claimed that emetine in small doses is provocative or stimulatory to the parasites and results in the passage of amoebae or of cysts in greater numbers in the stools, so facilitating detection of the infection. Lawrence [*ibid.*, 1947, v. 44, 209], Wenyon [*ibid.*, 1948, v. 45, 76] and others have considered these claims to be irrational and

unsupported by adequate evidence. The authors gave 3 grains of emetine bismuth iodide to 18 patients suspected of amoebiasis on clinical grounds, and followed this by a saline purge the next day; the loose stools of one of these patients then yielded parasites. Eighteen proven stool-positive patients were then similarly treated, and the stools of only 5 of them contained parasites, the stools of the other 13 having been cleared of parasites [as might be expected]. Provocative emetine therefore is useless in disclosing this infection. *A. R. D. Adams*

Jones, H. L., Cassis, G., Floyd, T. M. & Mansour, N. S. **Amebiasis: Controlled Linear Studies on Nondysenteric and Mild Hepatic Forms in Egyptians.** *Ann. Intern. Med.* 1955, Apr., v. 42, No. 4, 763–85, 10 figs. [56 refs.]

There is a wide diversity of opinion on the potentialities of various clinical types of *Entamoeba histolytica* infections. There is no uniformity of opinion as to whether virtually non-pathogenic, or even commensal, infections with the parasite may exist, or on the relationship thereto of the differences in the cyst sizes of different strains, races, or even species of the organisms. In fact there is little precise information on the natural history of human amoebiasis, especially in its non-dysenteric and mild hepatic forms. To supplement this scanty information the authors have undertaken " serial clinicocoprologic studies of subjects harboring small or large race of *E. histolytica* " both before and after specific treatment.

Nineteen relatively healthy Egyptians, of whom 15 were found to harbour intestinal infections with *E. histolytica*, were subjected to an intensive clinical enquiry and physical examination; the latter was repeated at weekly intervals and stools were re-examined at the same intervals. Cysts and amoebae were measured after wet fixation in Merthiolate-iodine-formalin solution [this *Bulletin*, 1954, v. 51, 311]; a cyst size of 9·6μ and an amoeba size of 12μ were taken as the dividing line between large and small races of parasites. The examinations were continued over 24 weeks. An analysis of the stool findings showed that the 15 patients could be divided into 2 groups; 10 who alternately or concurrently passed cysts and amoebae of both large and small races; and 5 who passed small race parasites only. Those of the first of these groups more frequently passed loose stools than did those of the latter, and they also suffered more from symptoms such as flatulence and abdominal cramps.

Eight patients with small-race infections, and 4 who had either mixed or pure large-race infections, retained their infections after a course of treatment with Vioform (15 days) and carbarsone (10 days); those patients with suspected hepatitis were also given chloroquine. These uncured patients were subjected to studies similar to those undertaken on the pretreatment cases, and the findings were similar. It is noted that 7

patients whose infections were successfully eradicated by specific treatment were relieved of their minor symptoms and signs, and clinically became indistinguishable from a series of normal control patients.

A. R. D. Adams

da Silva, J. R. Contribuição ao estudo do comprometimento hepático na amebíase. [**Study of Liver Involvement in Amoebiasis**] *Bol. Centro de Estudos Hosp. Servidores Estado.* Rio de Janeiro. 1954, May, Suppl., pp. ii + 144, 10 figs. [234 refs.] English summary.

In this lengthy thesis, the author discusses results of his investigation of the pathology of amoebic hepatitis and the incidence of liver damage in intestinal amoebiasis. The study was based on a large series of cases seen at the Hospital dos Servidores do Estado in Rio de Janeiro, Brazil.

He begins by a very full review of the literature, to which there are 234 references, and from which he concludes that a chronic form of amoebic hepatitis is rare and only follows the acute form which may be recurrent and in exceedingly rare cases may run a chronic course.

During 6 years 145,000 out-patients were seen at the hospital. Studies were made of 725 post-mortem examinations, representing 70 per cent. of all deaths during that period and only one case of amoebic abscess of the liver was found.

Records of 82 patients with amoebiasis did not reveal a clinical picture of a " complicating " amoebic hepatitis.

Clinical and laboratory data are given of 40 cases of chronic amoebiasis, of which only 18 were not complicated by other causes of hepatic damage such as *Schistosoma mansoni* (13 cases), infectious hepatitis (6) and protein deficiency (3). Liver function tests were more strikingly positive in these 22 complicated cases, as were histological changes shown by liver biopsy.

The results are discussed in detail and illustrated by a number of photomicrographs of histological changes. The author concludes that the pathological changes in the 40 cases studied are not specific of a chronic amoebic hepatitis, but that they reflect a reaction of the liver to chronic intestinal amoebiasis. He postulates a non-specific mechanism of unknown nature, probably related to the absorption of bacterial toxins through the bowel and perhaps alimentary deficiencies associated with the parasite.

H. J. O'D. Burke-Gaffney

André, M. & Cornet, L. Les formes hépato-coliques de l'amibiase suraiguë. Suppurations hépatiques et perforations coliques. [**Hepato-Colic Forms of Hyperacute Amoebiasis; Hepatic Suppuration and Perforation of the Colon**] *Méd. Trop.* Marseilles. 1955, Mar.–Apr., v. 15, No. 2, 143–67, 2 pls.

Fulminating amoebic colitis with involvement of the liver is a very rare condition, and it may end in extensive amoebic visceral invasion. It is rare even in Indo-China where amoebiasis is common; it is difficult to diagnose as the symptomatology varies with the particular organs most involved, but it can be fatal within 1 to 4 weeks. On autopsy diffuse amoebic lesions of all sizes are to be found throughout the large bowel, in the liver and the adjacent peritoneum. In the last 5 years 12 such generalized fulminating types of infection with *Entamoeba histolytica* have been found in young men of military age in Indo-China; 10 of them died as a result of it. Details of these cases are given in the text, and an attempt is made to classify them according to their initial presenting symptoms. No specific bacillary infection could be incriminated as a precipitating cause of this fulminating disease, but doubtless the bacterial flora in these particular cases were peculiarly conducive to the infecting amoebae, which so freely spread that this grave condition resulted.

Neither treatment with amoebicides (emetine and soluble iodine compounds) and penicillin and streptomycin, nor treatment with antibiotics (chloramphenicol and oxytetracycline) alone prevented death; but the treatment with emetine together with chloramphenicol and oxytetracycline of 3 patients resulted in the recovery of 2 of them. Surgical intervention in such cases should be restricted to evacuation of liver abscess contents after the specific medical treatment has taken effect.

A. R. D. Adams

Subramaniam, R. **Treatment of Amoebiasis.** *Indian Med. Gaz.* 1954, Oct., v. 89, No. 10, 583–8.

Records of the Government General Hospital, Madras, over the last 10 years show that the incidence of amoebic dysentery among in-patients is much less than that of bacillary dysentery. There has been a steady decline in the mortality of bacillary dysentery since the introduction of the sulphonamides for treatment, but the mortality due to amoebic dysentery remains unaltered. The manifestations of amoebiasis may be colonic or extra-colonic; the latter are not easy to diagnose, but the commonest organ affected is the liver, and then the lungs, skin and brain are involved in a declining incidence. Lung involvement is usually secondary to liver involvement, but it may occur independently of it and be primary.

To control acute colonic amoebiasis emetine is the drug of choice; 1 grain is given daily for 6 days; it may cause temporary toxic side-effects. A mild dysentery can be controlled by giving an iodo-quinoline compound (Enteroquinol) by mouth for 20 days, and retention enema of Chiniofon; thereafter a pentavalent arsenical (Stovarsol or carbarsone) is given for 10 or even for 20 days. A course of EBI (emetine bismuth iodide) then follows for 12 days.

When there is liver involvement chloroquine is an excellent drug; but the author gives it as a routine in all cases of amoebiasis to forestall the occurrence of this. Chloroquine by the oral route is ineffective for the control of acute amoebic dysentery; but when given as a retention enema it slowly stops the acute attack of dysentery.

Viasept and Neoviasept [see this Bulletin, 1955, v. 52, 1086] have also been used by the author; the former, which is an arsenical, is valueless for extra-intestinal amoebic infections; the latter, which is the same drug with added chloroquine, has the expected effect on them. The author advocates Neoviasept, in view of its lack of toxicity, to succeed treatment with the iodo-oxyquinoline compounds in the course outlined above; it is given for 8 days. He follows this with an 8-day course of Ilotycin [erythromycin] as this antibiotic is directly amoebicidal. A further 8-day course of Neoviasept concludes the treatment, which is repeated in its entirety after 3 months. *A. R. D. Adams*

Mackie, T. T., Mackie, J. W., Vaughn, C. M., Gleason, N. N., Greenberg, B. G., Nenninger, E. S., Lunde, M. N., Moore, L. L. A., Kluttz, J. A. & Taliafero, M. O., with the assistance of (Mrs.) A. Holderman. **Intestinal Parasitic Infections in Forsyth County, North Carolina: I. Diodoquin for the Mass Treatment of Amebiasis.** *Southern Med. J.* 1955, July, v. 48, No. 7, 737–44. [29 refs.]

Conflicting views are held by different workers, and inconsistencies of opinion have been expressed even by a single worker, on the efficacy of di-iodohydroxyquinoline (Diodoquin) as a sterilizing agent for intestinal amoebiasis. The authors therefore decided to undertake a further study of its value for this purpose, in the form of mass treatment under conditions where the risk of reinfection was reduced to a minimum. A diagnosis of amoebiasis was made by stool examinations; both white and Negro children were the initial subjects for the study; when found to be infected, stools of all the persons living with them in the same house were examined, and then the child and all its cohabitants—whether infected or not—were concurrently treated with Diodoquin for 20 or 21 consecutive days; control groups were given a placebo over a similar period. Single stools of those treated were re-examined at 3-month intervals on two occasions.

The authors reach the following conclusions:

(1) Amoebiasis is a familial disease. Multiple infections within the family group are the rule rather than the exception. When an individual is found to be infected by *Entamoeba histolytica* the probabilities are that approximately 60 per cent. of the members of his family are infected by this parasite.

(2) The examination of schoolchildren in Grades II, III, IV and V

provides a valuable procedure for the location of cases of amoebiasis in the community.

(3) The control of amoebiasis, like that of enterobiasis, requires effective treatment of the family unit rather than treatment of only the individuals proven to be infected.

(4) Di-iodohydroxyquinoline, USP (Diodoquin) used under controlled conditions designed to reduce to a minimum the possibility of re-infection, proved to be a highly efficient therapeutic agent for the elimination of *Entamoeba histolytica* in clinically mild cases of chronic amoebiasis.

(5) The observed prevalence of *Entamoeba histolytica* prior to therapy among 301 persons studied was 40·5 per cent.; six months after treatment by Diodoquin the observed prevalence was reduced to 1·7 per cent. Apparent protozoological cures were obtained in 97 per cent. of the 301 persons treated.

(6) Diodoquin is a safe, non-toxic, well tolerated and useful agent for the mass ambulatory treatment of chronic amoebiasis irrespective of the ages of the individuals. *A. R. D. Adams*

YANAI, T. **On the Influences of *Escherichia coli* upon the Experimental Infection of *Entamoeba histolytica* in Rats. II. Effect of the Administration of Antibiotics, Killed Bacterial Cells and their Metabolic Products.** *Keio J. of Med.* Tokyo. 1954, Sept., v. 3, No. 3, 129–39, 3 figs.

The author had previously shown that rats harbouring abundant *Bact. coli* in their gut were more readily infected with *Entamoeba histolytica* than rats with a scantier bacterial infection. In the present investigation the effect of this bacterium upon experimental amoebiasis in rats was studied, by reducing the number of *Bact. coli* naturally present in the rats with sulphathiazole and streptomycin, and substituting them by the same species of bacteria of human origin, after which the animals were inoculated with *E. histolytica*. It was found that, after the number of bacteria was reduced with sulphathiazole, the susceptibility of the rats to infection with the amoebae was not markedly altered. However, when these bacteria were removed by streptomycin and large amounts of a human strain of *Bact. coli* were inoculated, the rats became highly susceptible to infection with *Entamoeba histolytica*, with the production of ulceration.

On the other hand, when cultures of *Bact. coli* were killed with toluol, and the killed bacterial cells with their metabolic products were administered to rats, the amoebic infection was not affected.

It is concluded that " the main factor of bacterial influence upon the infectivity of amoeba seems to be not the absolute number of bacteria but some physico-chemical condition in the large intestine which is brought about by the abundant growth of bacteria ". *C. A. Hoare*

Okamoto, J. **On the Influence of *Clostridium perfringens* upon the Experimental Infection of *Entamoeba histolytica* in Rats.** *Keio J. of Med.* Tokyo. 1954, Sept., v. 3, No. 3, 121–7.

Since in the literature on amoebiasis there are indications that *Clostridium welchii* promoted the growth and development of *Entamoeba histolytica* in cultures, whereas the evidence of its effect upon the production of ulceration in experimentally infected animals was conflicting, the author undertook a study of the effect of this micro-organism upon the course of amoebic infection in rats, which were fed on samples of human faeces containing cysts of *E. histolytica*. The results of the experiments were assessed by daily microscopic examination of the faeces and, at autopsy, of the contents of the large bowel for the presence of amoebae. The cultural method was also used for this purpose, and the intestinal wall was inspected for the presence of lesions.

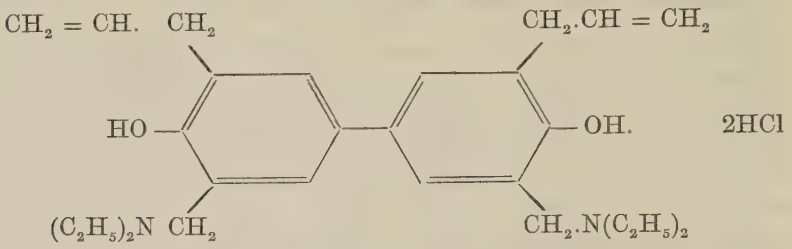
In one experiment the feeding of amoebic cysts to 48 rats was followed, 7 days in succession, by peroral administration of *Clostridium welchii*. In none of the infected rats (13) were any lesions observed, indicating that this bacterial species did not induce ulceration. In another experiment 2 strains of *E. histolytica* were used for the infection of rats: one from a chronic case of human amoebiasis, which was virulent, was inoculated into 20 rats; the other, from a contact-carrier, which was not virulent, was inoculated into 10 rats. In both cases it was established that a certain proportion of the rats harboured natural infections with *Clostridium*, but whereas the virulent strain of amoebae produced ulceration, no lesions were present in rats infected with the avirulent strain. In order to throw further light on this problem attempts were made to eliminate the natural infections of rats with *Clostridium* by repeated administration of streptomycin or homosulphamin, but as these substances failed to eliminate the bacteria in some of the rats, it was not possible to establish any correlation between the presence or absence of this bacterium and the course of amoebic infection.

It is concluded that the infectivity of the amoebae and the ulceration produced by them in rats were determined mainly by the pathogenicity [virulence] of the strains of *E. histolytica*, whereas the presence of *Clostridium* "had little, if any, effect upon them." *C. A. Hoare*

Thompson, P. E., Reinertson, J. W., McCarthy, D. A., Bayles, A. & Cook, A. R. **Biallylamicol, a New Amebicide: Chemotherapeutic Studies in Intestinal and Hepatic Amebiasis in Animals.** *Antibiotics & Chemotherapy.* New York. 1955, Aug., v. 5, No. 8, 433–43. [27 refs.]

Biallylamicol, also known by the trade name of Camoform, was described as SN 6771 with activity about equal to that of quinine in

malaria in *A Survey of Antimalarial Drugs 1941–1945* [this *Bulletin*, 1947, v. 44, 1106]. It has the following constitution:—



and is a white powder soluble in water. Previous reports have indicated that it is of value in human amoebiasis [*ibid.*, 1955, v. 52, 156, 779]. In the present investigation two strains of *E. histolytica*, accompanied by a mixed bacterial flora, were used for *in vitro* tests and the more virulent strain was also used to infect weanling rats, and dogs. The techniques used have already been described [*ibid.*, 1950, v. 47, 741]. For evaluating drugs in hepatic amoebiasis hamsters were used. Drugs were generally given to dogs in gelatin capsules or as tablets, twice daily for two 5-day periods separated by an interval of 2 or 3 days. Spontaneous recovery in these animals was rare. In rats the drug diet method of treatment was used, being started 3 hours after inoculation and continued till animals were killed 7 days later. When biallylamicol was given to rats together with neomycin and bacitracin, or with certain other antibacterial agents, the effectiveness of the drugs was much increased. In rats and dogs there was apparently a synergic effect between the drug and the two first-named antibiotics. *In vitro* it was effective against both strains of parasite, and appeared to act directly on the amoebae rather than on accompanying bacteria.

The method of infecting hamsters intra-hepatically, previously described, was used [*ibid.*, 1952, v. 49, 511]. There was a marked storage of the drug in liver, lungs and other tissues of hamsters and it proved a useful prophylactic on that account. It had limited activity against other protozoa, and showed little promise against certain helminths, bacteria or viruses. The moderate activity against acute intestinal amoebic infections in rats and dogs and relatively greater effect against amoebic hepatitis in hamsters suggest that in suitable dosage it may yet prove its worth in the last-named type of infection.

J. D. Fulton

Rendtorff, R. C. & Holt, C. J. **The Experimental Transmission of Human Intestinal Protozoan Parasites. V. Multiple Infections produced with Three Species of Amebae.** *Amer. J. Hyg.* 1955, May, v. 61, No. 3, 321–5, 1 fig.

It has been noted that " mixed infections of human intestinal amebae occurred with greater frequency than can be accounted for by a chance

occurrence of the independent species" [this *Bulletin*, 1939, v. 36, 598; 1953, v. 50, 1042]. The authors describe their attempts to explain this phenomenon by producing experimental infections in 12 human volunteers with 100 cysts of each of 3 species of amoebae (*Iodamoeba bütschlii*, *Entamoeba coli* and *Endolimax nana*). The cysts were isolated from fresh stools and administered to the men in gelatin capsules, one species at a time, at intervals of several days.

The results of these experiments were as follows: out of 12 persons, 3 remained uninfected, while 5 became infected with one species each (*Iodamoeba* in one case, *Entamoeba* and *Endolimax* each in two cases), one with 2 species (*Endolimax* + *Iodamoeba*), and 3 with all three species. In none of these cases were any gastrointestinal symptoms observed. In the course of this work observations were made on the prepatent [incubation] period, which was as follows in the 3 amoebae in question (the extreme figures indicate range of variation, and the middle figure shows the average; in all cases in days): *Iodamoeba bütschlii* 4:7·2:13, *Entamoeba coli* 5:10·2:16, *Endolimax nana* 7:12:21. When the mass concentration technique was used for the detection of cysts in the stools of the volunteers, the incubation period was shown to be about 0·5, 1·5 and 3 days shorter in these species, respectively.

[The authors claim that, as far as they are aware, they were the first to produce experimental infection of man with *Iodamoeba bütschlii* and *Endolimax nana*. However, in the case of the latter species, this had already been achieved by Dobell more than 20 years ago (this *Bulletin*, 1934, v. 31, 352). For previous parts of this study, see this *Bulletin*, 1954, v. 51, 1162, 1163; 1955, v. 52, 640, 641.] *C. A. Hoare*

Ansari, M. A. R. **An Epitome on the Present State of our Knowledge of the Parasitic Duodenal Flagellate of Man—*Giardia intestinalis* (Lambl. 1859).** *Pakistan J. of Health.* 1954 & 1955, Oct. & Jan., v. 4, Nos. 3 & 4, 131–58; 175–94, 4 pls. [31 refs.]

In this paper the author gives a comprehensive review of our present knowledge of the human intestinal flagellate, *Giardia intestinalis*, and its relation to the host. After a discussion of the history, taxonomy and nomenclature of this parasite, its geographical distribution is listed. The morphology of *Giardia* is briefly described and illustrated in two plates. An account is then given of its habitat, and it is shown that this flagellate occurs chiefly in the small bowel, especially the duodenum, but may also extend to the bile ducts and gall bladder. A table occupying 5 pages covers the incidence of *Giardia* in various countries throughout the world, according to numerous named observers. The author then discusses the incidence of infection in relation to gastro-intestinal disorders, age-groups, sex and race, as well as the influence upon infection of institutional life and economic status of the patients. He then turns to the methods of

transmission and modes of dissemination of the parasite. Further, the author deals with variations in the structure and size of this flagellate and its cysts, which might be due to differences in the host environment. In this connexion the mode of nutrition of *Giardia* is described, and it is concluded that the chemical composition and physical state of the intestinal contents determine the morphological peculiarities of different strains.

An account is then given of the course and duration of giardial infections, and a table provides data on the association of *Giardia* with other intestinal protozoa in mixed infections. Another table serves as a check-list of species of *Giardia* recorded from diverse vertebrate hosts in various countries.

In the section devoted to pathology and symptomatology of giardiasis the evidence for regarding *Giardia* as a commensal or pathogen is considered. In this connexion the different disorders and symptoms, which clinicians attribute to this flagellate, are discussed, and it is concluded that there is still no absolute proof of its pathogenicity. Finally, a detailed account is given of the treatment of giardial infections.

[The foregoing brief account gives an idea of the wide scope of this paper, in which readers interested in the—mostly unsolved—problems posed by human giardiasis will find most of the available data, as well as references to authors, though only a selection of the literature is listed in the bibliography. These references are, however, marred by numerous and unaccountable errors in the spelling of authors' names.]

C. A. Hoare

Bellelli, L., Ciauri, G. & Mastrandrea, G. La curva ematica da carico di vitamina A nella lambliasi. [**The Blood Levels of Vitamin A in Giardiasis**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1955, June, v. 36, No. 6, 342–53, 1 diagram. [11 refs.] English summary.

Various workers have followed up the absorption of vitamin A, with its fat-soluble properties, by the intestinal route and have taken it as an indicator of fat absorption in such conditions as steatorrhoea. The authors report the cases of 22 subjects who complained of 2–3 motions a day, with the passage of doughy, glistening and often frothy stools which were chestnut or ochre yellow in colour, acid in reaction and at times mixed with mucus. Stool specimens showed large numbers of *Giardia* in both vegetative and cystic forms but no other parasites could be demonstrated. The patients were aged from 25 to 40 years.

Together with 5 normal subjects as controls the patients were put on a diet which included little vitamin A and each was given 1,500 IU of vitamin A for each kgm. of body weight in the form of cod-liver oil, containing 2,000 IU per gm., first thing in the morning before any food had been taken. Specimens of blood were taken at the same time and then again 4, 8 and 12 hours after ingestion of the vitamin. By means

of photo-electric colorimetry (Dann and Evelyn, *Biochem. J.*, 1938, v. 32, 1009) the authors estimated the vitamin A content in these specimens of blood and in samples of faeces. They have tabulated and plotted the curves of their results and they have found that the vitamin A content of the blood, estimated first thing in the morning, is higher in normal persons than in those who are infested with *Giardia*, and that higher blood levels can be attained more quickly in the former than in the latter. In the presence of *Giardia* infestation the vitamin is eliminated more rapidly in the faeces.

Large doses of vitamin A given intramuscularly did not affect the blood levels within the following 12 hours. The authors conclude that it is the presence of the parasite which interferes with the absorption of vitamin A when this is taken by ingestion. *J. Cauchi*

Coutelen, F., Breton, A., Biguet, J., Deblock, S., Mullet, S. & Doby, J. M. Étude comparative de l'activité de la Quinacrine, de la Nivaquine B et de la Nivaquine C dans la lambliose. [**Comparative Study of the Action of Mepacrine, Chloroquine and Sontoquine in Giardiasis**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 429–37. [14 refs.]

Mepacrine, though very effective, is not always an acceptable drug for the treatment of giardiasis in view of its side-effects. Both Nivaquine B [chloroquine] and Nivaquine C [sontoquine], both of them aminoquinolines, are said to be therapeutically effective for this condition. The authors have treated groups of children, aged from 2 to 6 years, who harboured heavy *Giardia* infections with these drugs. They conclude that in spite of its disadvantages mepacrine is the best of them; Nivaquine C is superior to Nivaquine B, though both are markedly inferior to mepacrine. *A. R. D. Adams*

Coutelen, F., Breton, A., Biguet, J., Deblock, S., Mullet, S. & Doby, J. M. Étude de l'activité de la Flavoquine dans la lambliose. [**Action of Amodiaquine in Giardiasis**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 437–44.

Flavoquine [amodiaquine], a 4-aminoquinoline, has been said to be therapeutically effective in giardiasis. On trial on children, aged from 2 to 6 years, harbouring this parasite it showed an activity about equal to that of Nivaquine B [chloroquine] in clearing the infection; it was well tolerated. Block graphs show the comparative therapeutic efficacies of mepacrine, sontoquine, chloroquine and amodiaquine in eradicating a *Giardia intestinalis* infection. *A. R. D. Adams*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Geigy, R. & Mooser, H. **Studies on the Epidemiology of African Relapsing Fever in Tanganyika.** *J. Trop. Med. & Hyg.* 1955, Sept., v. 58, No. 9, 199–201.

The authors made field observations on the distribution of *Ornithodorus moubata* in the Ulanga District of Tanganyika, during May to September 1954, and also studied its relation to the prevalence of infection with *Spirochaeta duttoni*. In 31 villages 340 houses were thoroughly searched and from 42 houses, spread over 12 villages, a total number of 5,000 specimens of *O. moubata* were collected and are referred to as "house-ticks". About 700 of these ticks have been dissected and examined for spirochaetes and approximately 14 per cent. were found to be infected with *S. duttoni*. The examination of wild rats, mice and fowls from tick-infested dwellings, both microscopically and by brain emulsions gave uniformly negative results. Only 4 cases of relapsing fever occurred in the villages which were kept under close observation although some were infested with ticks, and it seems probable that there is a high degree of immunity among the African population.

The survey of 55 burrows of the ant-bear (*Orycteropus afer*) resulted in the collection of nearly 1,200 specimens of the type *Ornithodorus moubata*, but these differed in various minor characters from the "house-ticks" and are referred to as "bush-ticks". They generally fed more rapidly and were more easily adapted to feeding on mice and guineapigs than the house-ticks. About 200 of these bush-ticks were examined for spirochaetes with uniformly negative results. Laboratory experiments, however, have shown that they are highly susceptible when fed on infected rodents.

Twenty-five warthogs were examined for spirochaetes with negative results and 3 captive specimens inoculated with infected blood showed no signs of infection.

Studies were made on a peculiar strain of *S. duttoni* from Itete, a village that was well known formerly for the high incidence of relapsing fever in the African population up to at least 1949. However, in 1954 the disease had practically disappeared, the only case being in a white missionary.

Several *O. moubata* were collected from African houses, especially in boys' dormitories, and 23·5 per cent. out of 330 dissected were heavily infected with *S. duttoni*. Suspensions of 71 of these infected ticks, when inoculated into white mice, produced infection in only 2 cases, a most unusual result. It would seem that this strain, therefore, has become non-pathogenic to both man and rodents.

The authors also found that infected ticks from this village after 2 years' transovarian transmission at the Swiss Tropical Institute had lost their infectivity.

An attempt to restore pathogenicity by inoculating human lice (*Pediculus humanus*) with this strain of spirochaetes gave negative results. *Edward Hindle*

YAWS AND OTHER TREPONEMATOSES

Masseguin, A., Brumpt, V. & Dulac, P. Traitement des tréponématoses en milieu tropical africain par les sels de diamine-pénicilline. [**The Treatment of Treponematoses in Tropical Africa by the Salts of Diamine-Penicillin**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 422–9, 2 figs. on pl.

The authors treated 100 cases of primary or secondary syphilis and 25 cases of yaws by single intramuscular injections of dibenzyl-ethyelene-diamine-dipenicillin (G) (Bicillin, Peridural, Extenciline). The dose used for syphilis was 2·4 mega units and for yaws half this dose for adults (100,000 units per kgm. for children).

All syphilitic lesions were freed of treponemata within 10 hours, in yaws treponemata were found up to 30 hours afterwards (one case) and in 8 out of 15 persisted for longer than 10 hours. This slightly later duration is attributed to the more florid lesions and to the smaller dose.

The clinical response was in all cases excellent and reactions were few and only temporary. Subsequently the serological changes were traced in 59 cases of syphilis but in only 10 cases of yaws. All those observed for periods of 4–8 months showed negative serology or a satisfactory reduction in titre. One patient became re-infected with syphilis but again responded to treatment.

[These observations confirm the suitability and effectiveness of this treatment.] *Frederick J. Wright*

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Nicholas, G. J. **Leprosy in British Guiana, 1954.** *Leprosy Review.* 1955, Oct., v. 26, No. 4, 156–62.

British Guiana has a population of about 479,000 and an area of about 83,000 square miles. The population is almost entirely confined to the coastal belt. Leprosy appears to have been introduced by African slave

labour, and later by Indian and Chinese immigrants. There is no history of it among the original Amerindians. An over-all incidence of leprosy is calculated at about 2·7 per thousand. Of the 1,259 known cases 611 are African and 491 East Indian. Admission figures in 1950 showed a ratio of $2\frac{1}{2}$ tuberculoid to 1 lepromatous; in 1954 the ratio was 6 to 1; among Africans the ratio was about 3 to 1 and among East Indians 5 to 1. Methods of control include compulsory notification and compulsory isolation of open cases, periodic examination of contacts, lepromin-testing of children vaccinated with BCG in the anti-tuberculosis campaign, periodic re-examination of discharged patients, yearly school examinations, and health education. A social welfare officer should be appointed for rehabilitation of recovered patients. *Ernest Muir*

Smith, M. L. **Survey of Leper Colonies in Kyongsang Namdo Province, Korea.** *Leprosy Review.* 1955, Oct., v. 26, No. 4, 147–55, 1 map.

Kyongsang Namdo is the southernmost province of Korea, and is the second largest, with a population of about 3 million. Leprosy patients are at present lodged in 22 colonies, including the Sangai leprosarium near Pusan. This paper is a report of an investigation of these village colonies with a view to deciding what changes and improvements should be made. Points to be reviewed were: effective segregation, land tenure difficulties, acceptance by local people, suitable local medical attendance, separation of uninfected children from parents. A plan for concentrating all the rural colonies in one leprosarium would need sympathetic handling, and adequate land and housing and opportunities for treatment. It is estimated that about one-fifth of the patients are of the lepromatous type. There are great differences between the various colonies in the nature of the land, supplies of food and the efficiency with which they are run. One of the most urgent recommendations is that a Provincial Leprosy Control Committee should be formed to safeguard the rights of the rural colonies and the health of the public. Other projects are: the building of preventoria, arrangements for preventive treatment of children of patients and BCG immunization, appointment of non-leprous superintendents for approved colonies, and sympathetic, long-term education of patients and the public. The paper is illustrated with a map showing the position of the colonies. *Ernest Muir*

See also p. 259, Roberto, Los problemas medicos de la Isla de Pascua. [**The Medical Problems of Easter Island**]

Nishiura, M. **A Proposed Classification of Leprosy.** *Acta Scholae Med. Univ. in Kioto.* 1954, v. 32, No. 1, 1–4.

The main difference between the classification proposed and that of other recent classifications [the Pan-American and that of the Madrid

Congress] is the addition of a neural type, subdivided into pure, secondary and maculo-anaesthetic. This combines the neuritic subdivisions in the former lepromatous and tuberculoid types and the indeterminate group. The reason for suggesting this change is that the " leprous changes of the nerve are not always parallel to that of the skin lesion and especially bacterioscopically. This fact suggests that the tissue resistance is more incomplete in the nerve than in the skin ". Under " Indeterminate Stage " the author gives no *clinical* subvarieties, though histologically they may be subdivided. The word " stage " is used both for indeterminate and tuberculoid divisions, as the lesions are not static but progressive. *Ernest Muir*

Paterson, D. E. **Radiological Bone Changes and Angiographic Findings in Leprosy with special reference to the Pathogenesis of ' Atrophic ' Conditions of the Digits.** Reprinted from *J. Faculty Radiologists.* 1955, July, v. 7, No. 1, 35–56, figs. 15–35. [37 refs.]

A study has been made of 542 films from 116 selected leprosy patients. Bone changes are divided into: bone destruction, joint changes, bone absorption, and osteoporosis. Bone destruction may be local and in the form of " cysts " due to foci of lepra bacilli, especially when lepra reaction occurs. A destructive lesion in the medulla may cause expanded cortex similar to tuberculous dactylitis. Joint changes are commonly the result of infection with lepra bacilli in the subarticular bone. But bone destruction is most commonly connected with injury resulting from the diminution or absence of sensation. The patient fails to take precautions after such injury and secondary infection enters and spreads to the bone.

Bone absorption is shown by radioscopic evidence that the bone has been evenly and smoothly removed from the ends or from the subperiosteal layers of the bone. The author does not believe that this change, which was found in 97 of the 108 cases, can be termed " atrophic "; it includes appearances similar to those seen in acute osteitis, periostitis and osteomyelitis in which there is no neural involvement.

By using angiograms, after intra-arterial injection of diodone, studies were made of the vessels of the fingers. Digital arteries were found to be narrowed in badly deformed fingers of leprosy in a way similar to that found in rheumatoid arthritis, but this may be due to want of use or to former non-specific infection.

Evidence is quoted for the theory that bone formation and destruction can be caused by nervous stimuli. " Where there is a nerve lesion it is known that trophic changes take place in the skin. In sensory loss there is absence of normal reflex stimuli that may well influence the mechanism of tissue repair and replacement. There may well be a similar reflex nervous mechanism controlling the balance between

osteoclasts and osteoblasts. There is no evidence, however, that the bone changes in leprosy are *primarily* due to loss of such a nervous mechanism." It is also shown that the type of concentric "atrophy" seen in leprosy, tabes and syringomyelia can also occur in mycetoma and non-specific ulceration where there is no disease of the nervous system. "It is thought that in cases of concentric absorption there is occlusion of the vascular end-loops in the soft tissue and in the periosteum as a result of periostitis, haematomas, or devitalized tissue. Blood-supply to the periosteum is therefore affected in such a way that osteoclasts rather than osteoblasts are at work. The vascular end-loops and the veins draining the medulla may be protected from this process, and so in the medulla compensatory new-bone formation can take place."

The article is illustrated with 35 figures. *Ernest Muir*

Chardome, J. & Lechat, M. Lésions radiologiques des mains chez le lépreux congolais. [**Radiological Appearances of Lesions of the Hands seen in Leprosy Patients in the Congo**] *Ann. Soc. Belge de Méd. Trop.* 1955, June 30, v. 35, No. 3, 267–78, 9 figs. on 4 pls. [23 refs.]

The hands of 126 patients in the Yonda leprosarium, Belgian Congo, were radiographed, and the lesions found are described in the text and by means of 9 photographs. The bone changes were: absorption, especially at the ends of the fingers and no different from that found in other neurotrophic troubles such as psoriasis, syringomyelia, Charcot's disease and Raynaud's disease; decalcification and osteoporosis present in 28 cases (osteitis was rare and was considered to be the result of injuries and other infections); cavities in the carpus were found in 17 cases, and these were not confined, as other authors had found, to the lepromatous type; blocking of the nutrient canals especially when there was absorption of the terminal phalanx; changes in the interphalangeal joints; and changes in sesamoid bones of the thumb. An attempt is made to classify the frequency of the lesions found according to the type and the duration of the disease. [There is no discussion of the mechanism of the bone changes.] *Ernest Muir*

Ridley, D. S. **The Bacteriological Interpretation of Skin Smears and Biopsies in Leprosy.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 449–52, 2 figs. on 2 pls. & 1 text fig.

It was found in histological studies of 11 leprosy patients that treatment did not always diminish the density of bacilli in the leproma, but led to invasion of the leproma by the surrounding healthy corium while the uninvaded portion remained densely bacteriologically positive. In

this way many nodules disappear during the early stages of the treatment. It is considered that serial biopsies at 2-month intervals, and the use of improved methods of staining sections, give a more accurate estimate of improvement under treatment, though multiple smears provide a more rigorous test of cure. *Ernest Muir*

Fernandez, J. M. M. & Cabanillas, L., with the technical assistance of Perla Zampettini. **Sensitization to Tuberculin induced by Lepromin.** *Leprosy Review.* 1955, Oct., v. 26, No. 4, 163–7.

Eighteen children of 2 to 8 years of age, who were living in a home and had had no known contact with leprosy, and whose Mantoux test (crude tuberculin 1:10) was negative, were given injections of 0·1 to 0·2 cc. of either extracted (Dharmendra) or whole lepromin antigen. Of these 44·4 per cent. became Mantoux positive in 6 to 7 weeks; but most of them were only weakly so, and became negative again in a few weeks. *Ernest Muir*

Lechat, M. La chlorpromazine (largactil) dans le traitement de 44 réactions léprotiques écloses après vaccination antivariolique chez les lépreux. [**Chlorpromazine in the Treatment of 44 Lepra Reactions Following Antivariolous Vaccination in Leprosy Patients**] *Ann. Soc. Belge de Méd. Trop.* 1955, June 30, v. 35, No. 3, 343–56, 1 graph. [13 refs.]

Out of 332 patients with the lepromatous type of leprosy, who were vaccinated against smallpox, 44 developed lepra reactions, severe in most of them. These 44 patients were treated for their reaction with small doses of chlorpromazine (Largactil), 125 to 475 mgm. in all, spread over 4 days. Of the 44 reacting patients 35 recovered quickly and completely, 6 improved less completely, and 3 showed no improvement. After stopping Largactil, reaction reappeared in 11 of the patients. *Ernest Muir*

Newman, F. & Anderson, A. **Preliminary Report on Treatment of Ulcers in Leprosy Patients at Ndjazen Leprosy Colony, French Cameroun.** *Leprosy Review.* 1955, Oct., v. 26, No. 4, 168–70.

The treatment included preventive measures and special dressings. With a view to prevention a survey was made of all the ways in which patients injured their hands and feet, and patients were taught to use proper shoes to protect their feet, and use certain appliances to protect their hands while cooking or at their work. All existing ulcers were divided into 3 categories. The more superficial ones were exposed to the sun and sprayed with a dye combining crystal violet, brilliant green and

acriflavine. Infected and foul ulcers were poulticed with magnesium sulphate in glycerin. Chronic, deep ulcers were scraped, and packed with vaseline gauze, and a plaster cast applied undisturbed for 6 weeks, during which time the patient could walk on crutches if only one foot was involved, otherwise he remained in bed [*cf.* this *Bulletin*, 1955, v. 52, 1100]. All the patients eventually recovered or found their way into the first category. *Ernest Muir*

Floch, H. & Gélard, A. Mode d'action des sulfones dans la lèpre (IX). Comment agissent les sulfones thymolées (argentiques ou non) administrées par la voie buccale. [**Mode of Action of Sulphones in Leprosy. (IX). What is the Effect of Oral Administration of Thymolysed Sulphones with or without the Addition of Silver?**] *Arch. Inst. Pasteur de la Guyane Française et de l'Inini. Publication No. 357.* 1955, Mar., 11 pp. [16 refs.]

In the course of examination of various disubstituted sulphones, the authors examined a commercial preparation (Diatox argentique) which is a mixture of (a) diphenylsulphone-4-4′-bis-azoparaisopropylmetacresol (Sulphone D), and (b) the same with 2 atoms of silver added. The criterion of effect is taken to be the amount of DDS concentration found in the blood and in the urine. The authors found that with the dose recommended (200 mgm. daily), or even with a double dose, the blood concentration did not rise above a trace, and the excretion in the urine was not more than 0·7 to 3·7 mgm. per 100 cc. The amount of both concentrations was very irregular, and larger doses did not increase the concentration.

These preparations are compared with Promacetin for which absence of toxicity was also claimed, compared with DDS. But it is pointed out that about 75 per cent. of Promacetin is excreted unaltered in the faeces, whereas almost the whole of DDS is absorbed. Besides, in 2 cases on " Diatox argentique " referred to, a moderate amount of leucopenia was caused.

The conclusion arrived at is that DDS is without any doubt superior to the disubstituted derivatives described. *Ernest Muir*

Buu-Hoï, N. P., Nguyen-Ba-Khuyen & Nguyen-Dat-Xuong. Six mois de chimiothérapie antilépreuse au Sud-Vietnam avec le 4,4′-diaminodiphénylsulfoxyde et le 4,4′-diéthoxythiocarbanilide. [**Six Months' Treatment of Leprosy in South Vietnam with 4,4′-Diaminodiphenylsulphoxide and 4,4 -Diethyloxythiocarbanilide**] *Bull. Acad. Nat. Méd.* 1955, v. 139, Nos. 15/16, 275–80.

The first of these drugs (styled DDSO for short) was tested for 6 months on 34 patients of whom 1 had leprosy of the indeterminate type,

6 of the lepromatous type, and 27 mixed [no definition is given of this term]. The daily dosage was 0·1 gm. given orally from the beginning of treatment and continued throughout. In 19 of these the effects of treatment were watched throughout, and in 13 there was more or less marked improvement clinically. In 2 patients the skin smears became negative, and in 14 the nasal smears became negative. There were no toxic symptoms, and there were no reactions except in 2 patients in whom they were evanescent and soon disappeared when the patients were put on reduced doses of 0·05 gm.

The second of these drugs (styled Dialide for short) was tested on 13 patients, of whom 2 had indeterminate leprosy and 11 mixed. The dosage was the same as for DDSO. There was clinical improvement in 11 patients, all signs almost disappearing in 2. Thickening of nerves quickly lessened. In 2 patients an eczematous rash came out all over the body and treatment had to be stopped. In 2 patients the skin smears became negative and in 11 the nose smears became negative.

Later, a group of 300 patients living at home have been treated with Dialide, and they have stood the treatment well except for a few who had eczematous eruptions at the beginning of treatment, which disappeared when the dosage was reduced. In all these patients the improvement was similar to that in the former group of 13 patients. The authors consider that in their patients the negativization of the nasal mucosa was more rapid than with sulphones as previously reported [this *Bulletin*, 1955, v. 52, 652]. *Ernest Muir*

Jopling, W. H. & Ridley, D. S. **Isoniazid with Sulphones in Lepromatous Leprosy.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 453–4.

Four batches of lepromatous (1 was border-line) patients were tested, 3 on sulphones, 3 on sulphones with isoniazid, 3 received the combined treatment followed by sulphones, and 2 received sulphones followed by combined treatment. The result failed to establish an advantage for either of the 2 types of treatment (sulphones alone or combined treatment) at the end of 2 years. The only side effect of isoniazid was an elevation of the glucose tolerance curve, followed by a return to normal after the cessation of treatment. [See also this *Bulletin*, 1954, v. 51, 699.] *Ernest Muir*

Garrett, A. **Isoniazid in Leprosy Treatment.** *Leprosy Review.* 1955, Oct., v. 26, No. 4, 171–5.

A group of 14 patients were chosen who were considered difficult because of the slowness or absence of bacteriological improvement, or

because of severe reactions. Dapsone was combined with isoniazid, 3 mgm./kgm. of body weight being given for the first 12 months, and 6 mgm. thereafter. A short clinical account is given of each patient. The results are thus described: " My opinion is that the improvement is more rapid than could be expected of Dapsone alone, but the difference is not very marked. Dapsone alone is so successful in the vast majority of our patients that the great addition to expense in buying Isoniazid and to staff time in giving daily treatment is not warranted for routine work. There are, however, the few for whom it appears that this additional treatment is of great value ". *Ernest Muir*

GUSSENHOVEN, G. A. **Treatment of Leprosy Patients with Isonicotinic Acid Hydrazide.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Sept., v. 7, No. 3, 280–84.

This is an English version of the paper abstracted in this *Bulletin*, 1954, v. 51, 1257.

CHAUSSINAND, R. & VIETTE, M. Peut-on utiliser la vaccination par le *Mycobacterium marianum* dans la prophylaxie et la thérapeutique de la lèpre? [**Can Vaccination with** *Myco. marianum* **be used in the Prophylaxis and Treatment of Leprosy?**] *Bull. Acad. Nat. Méd.* 1955, v. 139, Nos. 7/8, 165–9.

The only justification for the use of a vaccine prepared from *Myco. marianum* would be if it produced a stronger sensitivity to lepromin than does BCG, and the authors have shown by comparative trials that it does not do this. This organism belongs to a vast ill-defined group of mycobacteria known as paratuberculous, many members of which group have been tested in the treatment of leprosy but never with any beneficial results. It would therefore not be right to deprive leprosy patients of the value of sulphones in order to test the questionable therapeutic effects of *Myco. marianum*. *Ernest Muir*

ERRATUM

In the abstract of the paper by FLOCH & GÉLARD, this *Bulletin*, 1955, v. 52, 787, " DDS " in the last sentence should read " the diethyl derivative ".

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); NEMATODES (*Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

CRONK, P. G. **A Note on 100 Cases of Helminthiasis with special reference to Eosinophilia.** *J. Roy. Army Med. Corps.* 1955, July, v. 101, No. 3, 254–6.

This note is intended to remind newly arrived medical officers of the large amount of debility caused by parasitic infections in East Africa and the therapeutic benefit of anthelmintic treatment in cases which might have been diagnosed as other conditions.

The paper relates to some 80 Mauritians and 15 East Africans seen during 4 months. In 60, ankylostomes alone were seen, in 15 they were accompanied by *Ascaris* and in 1 each by *Taenia* and *S. haematobium*. *Ascaris* occurred alone in 15 and *S. haematobium* in 5.

Symptoms were divided into 7 main groups. These included 2 cases of meningism, with normal lumbar puncture findings, which responded to anthelmintics in 36–48 hours.

Haemoglobin estimations were done in 31 cases of hookworm infection, but anaemia (haemoglobin under 70 per cent.) was present in only 7.

A table shows the results of eosinophil counts of all cases, in relation to the parasites present. When the upper limit of normality was taken to be 400 per cmm., eosinophilia in all types of helminthiasis was mild in 46 per cent., marked in 20 per cent. and gross in 6 per cent.

Significant eosinophilia was present in 54 of 77 cases of ankylostomiasis. Treatment, which was by means of the usual drugs, is briefly described. *H. J. O'D. Burke-Gaffney*

PARENT, M. & LIETAR, J. Contribution à l'étude de la biologie des mollusques à Jadotville. [**Study of the Biology of Molluscs at Jadotville, Belgian Congo**] *Ann. Soc. Belge de Méd. Trop.* 1955, Feb. 28, v. 35, No. 1, 59–67, 3 figs. on 2 pls.

These workers have made a study of the egg-laying habits and characteristics of the egg-masses of *Lymnaea natalensis*, *Biomphalaria alexandrina pfeifferi* and *Physopsis africana* found in the Jadotville area. Also, investigation has been made into the efficacy of sodium pentachlorophenate and copper sulphate against the eggs of these molluscs.

The characteristic shape of the egg masses and the pattern of the contained eggs are described for each species. The size of the egg masses was found to vary with season—large masses laid in the dry season and

small masses laid in the rainy season. Observation was made on the length of the incubation period in relation to temperature, the effects of low *p*H on egg survival, the wide occurrence of egg-sterility in nature as opposed to laboratory cultures and the length of time taken for young snails to develop to maturity.

The interesting feature of this paper is that it describes how the ecological observations on the eggs of the mollusc were associated with attempts at control with $CuSO_4$ and sodium pentachlorophenate. It was found that under laboratory conditions neither of these substances killed the eggs when used in concentrations $CuSO_4$ 30 p.p.m. or pentachlorophenate 10 p.p.m. Both chemicals killed the snails but if used in the dry season, *i.e.*, the period of plentiful egg laying, then the treated area became heavily reinfested owing to the development of the unaffected eggs. The authors' recommendation is, for this geographical region at least, that molluscicides, both known and potential, should be tested when the eggs are fewest and that the treatment should be repeated about one month later. Certain disadvantages or other points associated with the use of these chemicals as molluscicides are stressed: (1) possible accidents to persons living along the streams; (2) the death of all fish; (3) the desirability of at least superficial clearance of the streams before treatment is started. *O. D. Standen*

Gaud, J. & Dupuy, R. Rythmes saisonniers de développement de *Bulinus truncatus* en élevage au laboratoire. [**Seasonal Rhythms in the Development of** *Bulinus truncatus* **under Laboratory Conditions**] *Bull. Inst. Hyg. Maroc.* 1954, v. 14, Nos. 1/2, 111–16, 2 figs.

DeWitt, W. B. **Influence of Temperature on Penetration of Snail Hosts by** *Schistosoma mansoni* **Miracidia.** *Exper. Parasit.* New York. 1955, May, v. 4, No. 3, 271–6, 1 fig. [11 refs.]

The purpose of the investigation was to determine the effects of temperature on the penetration of miracidia into their snail hosts. Gordon *et al.* [this *Bulletin*, 1935, v. 32, 237] infected *Bulinus* (*Physopsis*) *globosus* with *Schistosoma haematobium* and *Planorbis* [*Biomphalaria*] *pfeifferi* with *S. mansoni*, and showed that once miracidial penetration had occurred the subsequent sporocyst development increased directly with increases in the temperature of the aquarium in which the snails were kept, the optimum temperature for development being limited by the maximum temperature tolerated by the snail host. The results of the experiments reported by Dr. DeWitt in the present paper lead him to conclude that " (1) the ability of *S. mansoni* miracidia to penetrate the snail host is probably directly related to environmental temperature,

(2) that the degree of relationship may vary with different strains, and (3) that the optimum temperature may be limited by the maximum temperature tolerated by the snail. It is possible that at the lower temperature penetration might occur; however, the miracidia are adversely affected by the chilling and normal development does not take place.

" The finding that *S. mansoni* miracidia are unable to penetrate *A. glabratus* at 10°C. would seem to imply that the chance of miracidia infecting snails at this or lower temperatures is nil. This is of obvious significance in understanding the epidemiology and effective control of the disease in areas where seasonal variation of temperature is marked ".

[It is to be hoped that these interesting experiments, carried out with American strains of *Australorbis glabratus* and American strains of *S. mansoni*, will be repeated with African strains of *S. mansoni* and the appropriate African snail hosts.] *R. M. Gordon*

Deschiens, R. & Jadin, J. Viabilité des mollusques vecteurs des bilharzioses dans les eaux profondes. [**Survival in Deep Water of Molluscan Hosts of Schistosomes**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 5, 668–71, 2 figs. on pl.

The authors report a small series of experiments in which " *Planorbis* " [*Biomphalaria*] *adowensis* and " *P.*" [*Australorbis*] *glabratus* were submerged for periods of 16 to 42 days at depths of 2 to 10·5 metres in the Seine. Ninety-five per cent. of the snails survived in cages submerged in depths up to 10 metres but kept suspended off the bottom. In these experiments the cages of snails were supplied with food. Further experiments in which the cages were placed on the bottom and not supplied with food resulted in complete mortality. Few conclusions can be drawn from this as some of the empty shells found in the cages were cracked—it is presumed by crayfish belonging to the American genus *Cambarus*, introduced about 20 years ago and now established in abundance in parts of the Seine basin. *Cambarus* is known to be abundant in the region of the Suresnes weir where the experiments were carried out. On the other hand it is not known whether the aquatic plants (of *Elodea* type) available on the bottom were in fact suitable food for the planorbids. It is not known, therefore, whether the crayfish had been active predators killing living snails, or whether the snails had died in the absence of food and their soft parts had then been eaten by the crayfish. The authors suggest that, if the former possibility is correct, *Cambarus* could be utilized [this *Bulletin*, 1955, v. 52, 909] for the biological control of medically important snails. [The experiments are very inconclusive and open to criticism on two grounds: first, their small scale and lack of replication (only two cages were involved, and 20 specimens of one species and 10 of the other); and second, the respiratory needs of the snails are not taken into account (the actual size of the specimens of snails used

is never mentioned, and it is known that only below a certain size can pulmonate snails survive submerged, obtaining sufficient oxygen by cutaneous gas exchange over the entire exposed surfaces of their tissue, see *Proc. Roy. Soc. Edinburgh*, (B), 1953, v. 65, 84–105; 143–165).]

W. Russell Hunter

Paraense, W. L. & Deslandes, N. **Observations on the Morphology of** *Australorbis glabratus*. *Mem. Inst. Oswaldo Cruz*. 1955, May, v. 53, No. 1, 87–103, 9 text figs. (1 coloured) & 30 figs. on 4 pls.

——————— & ———————. **Observations on the Morphology of** *Australorbis nigricans*. *Ibid.* 121–34, 11 text figs. & 15 figs. on 3 pls.

These two papers will be of interest to malacologists in that they describe the anatomical differences observed between *Australorbis glabratus* and *A. nigricans*. While admitting the wide range of individual variation in morphology within both species the authors consider that the presence of a pigmented " renal ridge " running along the ventral surface of the renal tube in the adult *A. glabratus* or a pigmented line in young forms of that species distinguishes it from *A. nigricans* in which this structure is consistently absent. As supporting evidence that *A. nigricans* is a good species it is submitted that for equal shell diameters the greater body length of *A. nigricans* shows a statistically significant difference from that of *A. glabratus*; that the lateral surfaces of the shell of *A. nigricans* show marked carination as distinct from the smooth lateral walls of the shell of *A. glabratus;* that a section through a plane corresponding to the greatest shell diameter shows that in *A. nigricans* the width of the whorls is about twice the height, while in *A. glabratus* the whorls are higher and less wide. These conchological differences are not always distinct, and, if taken alone, *A. nigricans* may be mistaken for *A. glabratus*. The distribution of these species is not known, nor is it known whether hybridization occurs.

Both papers contain detailed descriptions of the anatomy of the reproductive systems and the standard deviations observed in the dimensions of the organs. They should be consulted in the original.

O. D. Standen

Payet, M., Pène, P. & Camain, R. Considérations sur la bilharziose à *Schistosoma haematobium* dans la région de Dakar, à propos de 70 observations. [**Comments on Schistosomiasis due to** *Schistosoma haematobium* **in the Region of Dakar with reference to 70 Cases**] *Bull. et Mém. École Préparatoire Méd. Pharm. de Dakar.* 1954, v. 2, 23–35, 8 figs. [Numerous refs.]

During the last 2 years some 70 cases of disease due to *Schistosoma haematobium* infection have come under the authors' observation. There

were the usual varied clinical manifestations of the infection, but the expected urogenital involvement predominated in these cases.

A. R. D. Adams

Eiwi, A. M. & El-Tiraei, I. **Bilharziasis of the Appendix. A Pathological Study.** *J. Egyptian Med. Ass.* 1955, v. 38, No. 5, 311–26, 5 figs. on 2 pls. [34 refs.]

Schistosomiasis of the appendix was first described in 1909 by Turner (*Transvaal Med. J.*, 1909, v. 5, 210), who found schistosome ova in the appendix in 74 per cent. of an unselected series of autopsies of Africans in Eastern South Africa; the species was mostly *S. haematobium*. Abdel Shafi in 1940 (*J. Roy. Egyptian Med. Ass.*, 1940, v. 23, 1) drew a distinction between schistosomal appendix, constituting two-thirds of 206 cases, in which the ova were present in the walls of the appendix without accompanying bacterial infection, as part of a widespread schistosomal infection, and schistosomal appendicitis with associated bacterial infection. Opinions differ as to whether the presence of schistosome ova predisposes to infection; most patients in one series manifested dysenteric symptoms with abdominal colic and profuse mucoid diarrhoea, irrespective of whether appendicular infection with ova was proved to exist or not, favouring the conclusion that their seat of origin is the colon, not the appendix [Lovett-Campbell and Rose, this *Bulletin*, 1937, v. 34, 393], but in a few cases gross changes in the appendix appeared to be responsible for appendicular symptoms.

The authors describe the results of a study of 470 appendices removed at operation, fixed, bisected longitudinally, sectioned and stained. There were 93 (19·8 per cent.) appendices in which schistosomal lesions were demonstrated, in 10 of these the associated pathological lesions were insignificant, but in 83 there were gross lesions comparable to those found in cases of non-schistosomal appendicitis. There were 33 appendices in which the schistosomal granuloma had caused irregular thickening of the wall and stenosis of the lumen; in 8 of this group there was acute diffuse suppurative inflammation. In 44 the schistosomal granuloma had caused uniform thickening of the wall without stenosis, in 13 of this group there was acute diffuse suppuration. In 6 cases the lumen was completely obliterated by a core of fibrous tissue impregnated with ova. The most frequent site for the deposition of ova was the submucosa in both the obliterative and non-obliterative groups; the percentage with heavy deposit was 6·8 in the group with stenosis, 2·9 in the other group. The marked fibrosis which follows heavy schistosomal infection is the main factor responsible for the development of stenosis of the lumen, causing symptoms of obstructive appendicitis, especially if inspissated faeces block the lumen, and may lead to acute suppurative appendicitis. The authors consider that in the non-obliterative type the active inflammation attending the deposition of the schistosome ova in

the early stages causes the symptoms of chronic appendicitis, as does the fibrosis in the late stages. In over 70 per cent. of the lesions the ova were calcified and surrounded by fibrosis. Stout appendicular adhesions, an accepted cause of pain, occurred in 30 per cent. of cases of schistosomal appendicitis, particularly in the non-obliterative type. Subserous schistosomal nodules were found in 3·5 per cent. of the cases.

Five photographs on 2 plates illustrate the findings.

W. L. Harnett

LICHTENBERG, F. **Lesions of the Intrahepatic Portal Radicles in Manson's Schistosomiasis.** *Amer. J. Path.* 1955, July–Aug., v. 31, No. 4, 757–71, 15 figs. on 5 pls. [23 refs.]

The vascular distribution of the ova of *S. mansoni* is well recognized, but the lesions produced in the blood vessels and the route followed by the eggs during their passage from the lumen of a blood vessel to the lumen of the gut have received very little attention.

The author's study is based on the examination of 27 cases of *S. mansoni* infection occurring in a series of 52 consecutive non-selected necropsies carried out in Bahia, Brazil. On the basis of the anatomical lesions observed, 20 of the cases were classified as mild and 7 as severe; the latter usually showed a combination of advanced organic lesions of the intestine, liver and lung, 6 patients had hepatic fibrosis, pulmonary arteritis was present in 5 and 3 had advanced fibrosis and rigidity of the colon. In 19 (70 per cent.) cases lesions of a type not previously described were present in the intrahepatic portal radicles. "The lesions were of three types: substitution by granuloma of a portal radicle; fibrosis and narrowing, a more advanced lesion found in fibrotic portal fields; and intrahepatic thrombophlebitis, an obstructive lesion of larger venous ramifications, which may be analogous to schistosomal pulmonary arteritis. Intrahepatic thrombophlebitis was found only in advanced cases showing pipe-stem cirrhosis.

"Intrahepatic vascular lesions arise early in Manson's schistosomiasis, and are frequent in the severe cases. They may be one of the causes of frequency and severity of portal hypertension in this disease.

"The vascular lesions of Manson's schistosomiasis in the liver parallel the vascular lesions in other organs, most notably in the lung, and therefore suggest a similar pathogenesis."

The author suggests that previous failure to record these intrahepatic vascular lesions may have been due to the fact that "the lesions described here leave the vessels either substituted by granulomatous tissue, or markedly atrophied and inconspicuous, so that it is necessary to search systematically for the portal radicles in order to discover these alterations which, furthermore, may be inapparent unless certain special stains are utilized".

R. M. Gordon

Al-Deeb, A. A. **The Risks and Complications of Contrast Media in Visceral Bilharziasis.** *J. Egyptian Med. Ass.* 1955, v. 38, No. 6, 359–62.

Angiocardiography, percutaneous splenic portography and cholangiocystography were done on patients suffering from schistosomiasis. The contrast media used were organic iodine compounds; these must be injected rapidly in large quantities to obtain a satisfactory visual density. Of 65 patients so treated 12 suffered from slight to severe jaundice; one patient had a facial palsy and peripheral neuritis; and 2 suffered from a " transient diabetes mellitus ". In one case a fatal cholaemia resulted.

The toxic effects of the injections were ascribed to retention of the drugs following damage to the liver and kidneys resulting from the schistosomal disease. *A. R. D. Adams*

Andrade, Z. A. & Rodrigues, G. Manifestações pseudoneoplásicas da esquistosomose intestinal. [**Pseudo-Neoplastic Manifestations of Intestinal Schistosomiasis**] *Arquivos Brasileiros de Med.* 1954, Nov.–Dec., v. 44, Nos. 11/12, 437–44, 5 figs. [15 refs.]

The English summary appended to the paper is as follows: —

" The authors report on two cases of chronic intestinal obstruction in which intestinal lesions of schistosomiasis simulated both clinical and radiologically a carcinoma of the colon. Patients were operated upon and the gross and microscopic findings of the surgical specimen are presented.

" Some comments are made on the pseudo-neoplastic lesions of intestinal schistosomiasis after the presentation of a brief review of the literature."

Spingarn, C. L. & Edelman, M. H. **Observations on the Treatment of Schistosomiasis mansoni with Fuadin.** *Ann. Intern. Med.* 1955, June, v. 42, No. 6, 1199–205. [30 refs.]

Many more Puerto Ricans, among whom Mansonian schistosomiasis is prevalent, have recently come to New York City. Forty-six with *Schistosoma mansoni* infections have been treated with antimony pyrocatechol sodium disulphonate (Fuadin; Stibophen) in Mount Sinai Hospital. There were 39 males and 7 females, varying in age from 11 to 46 years; 8 of them were under 18 years. The diagnosis in each case was made by finding viable ova in the stools or on rectal biopsy. Twenty-two patients were given the drug intramuscularly over 15 to 19 days; adults to a total of 40 to 50 cc. and adolescents 30 to 35 cc. The other 24 patients were given from 19 to 57 cc. of the drug, according to weight, within 5 days; the scale of gross dosage ranged from 0·5 cc./kgm. to 1·0 cc./kgm.

On completion of the treatment as many patients as would cooperate

were re-examined at monthly intervals. Ova could not be recovered by the end of the treatment from 16 of the 22 given the longer course of treatment. Of the 24 given the shorter intensive course 23 were free of eggs at this time. As a result of later observation, in some cases over a period of a year, it was established that of 22 treated with the longer course 13 (60 per cent.) again passed living ova; of the 19 treated with the short course 7 (27 per cent.) were known to have relapsed, but the incidence of relapse was lowest in those given the highest dosages, and of 7 given 1 cc./kgm. none was known to relapse.

The longer treatment was well tolerated but the shorter resulted commonly in severe reactions, especially on the 4th and 5th days. These took the form of vomiting, abdominal cramps, fever and a rash. There was usually an eosinophilia during the intensive treatment. The short course of treatment was deemed unsafe on account of its toxicity. In 3 cases with severe signs of toxicity Dimercaprol (BAL) was given in oil intramuscularly every 4 hours for 24 hours; clinical benefit followed in only 2 of them. *A. R. D. Adams*

Markowski, S. **A New Device for controlling the Molluscan Vectors of Schistosomiasis in the Gezira Irrigation System of the Sudan.** *Ann. Trop. Med. & Parasit.* 1955, June, v. 49, No. 2, 212–17, 7 figs.

In a previous paper [this *Bulletin*, 1954, v. 51, 702], the author reported that *Bulinus truncatus* and *Planorbis* [*Biomphalaria*] *boissyi* were carried by the current of the Blue Nile through the Sennar Reservoir into the Gezira irrigation system. This suggested the importance of preventing them from being distributed by the flow and he has now devised a trap which provides conditions attractive to the snails and filters out floating vegetation and débris carrying snails or their eggs. He uses palm leaves which, when submerged, become covered with algae on which the snails feed. The trap consists of a rectangular box-like frame measuring 6 feet long by 4½ feet wide by 3 feet deep, made of 1-inch iron bars, the corner bars being prolonged as legs which stand on the bed of the canal. Single palm leaves separated from each other are tied at the base and again 3 feet down the shaft to two rods which are fixed to the bars forming the sides of the frame. Series of these screens are spaced parallel to each other to fill the length of the frame, the leaves being arranged so that each covers the gap between the leaves on the rod in front. The traps are set side by side across the width of the canal and the leaves are cut at the bottom so as to form an arch. In this way water flowing through is only about 10 per cent. obstructed which does not affect the proper working of the canals. Snails and débris usually float on the surface and are caught in the leaves. Two sets of traps are necessary, one in use and one to replace it after about a month when the leaves decay.

Before installation of the traps the canal distal to the proposed site was thoroughly weeded and heavily sulphated, and a length leading to the site was sulphated to prevent the entry of snails before the traps were in position. In the first set of experiments they were placed in the water beside the banks leaving the middle of the canal open. Hundreds of snails were collected from the traps during the following 3 months but only 3 (*B. truncatus*) were found on searching the canals distally; these are thought to have been shaken off when the traps were lifted. In the final experiment, after preliminary weeding and sulphation, 4 traps were placed so as to form a barrier across the canal. They were treated with copper sulphate weekly and débris was cleared daily. During the 5 months of this experiment no snails were found on surveying the whole system fed from the trapped canal. This method is believed to give cheaper and longer-lasting results than chemical control, and large-scale investigation of the value of these traps in the Gezira canal system is urged. *T. H. Davey*

Dias, E. & Dawood, M. M. **Preliminary Trials on the Biological Snail Control with *Bacillus pinottii* in Egypt.** *Mem. Inst. Oswaldo Cruz.* 1955, May, v. 53, No. 1, 13–29, 11 figs. [11 refs.]

This paper describes some experiments with the organism isolated by the senior author in 1953, which was found to kill *Australorbis glabratus* [this *Bulletin*, 1953, v. 50, 825; 1954, v. 51, 284] and which was subsequently named *Bacillus pinottii*. These experiments were carried out in Egypt with the local snails.

Methods of culture of the organism are described first, good growth being obtained on 10 per cent. peptone water, meat extract broth and whole blood of cattle diluted with tap water. Attempts were made to infect domestic and wild animals, both by ingestion and by contamination of scarified surfaces, without success, and men contaminated with the bacillus in the field showed no ill-effects. Cultures of *B. pinottii* mixed with an equal quantity of powdered peptone were added to water containing *Bulinus truncatus* and *Planorbis* [*Biomphalaria*] *boissyi* in vials, at a concentration of 1:50, and within 24 hours 93 per cent. and 73 per cent. respectively were dead and all died within 3 days, though a good number were still alive in the controls. A further experiment with the same snail species exposed to the culture-peptone mixture in dilutions ranging from 1:10 to 1:10,000,000 resulted in the death of all the snails within 7 days except in the highest dilution in which 50 per cent. of *P. boissyi* survived. Cultures grown in 5 per cent. boiled blood in water killed 90 to 100 per cent. of snails, presumably of the same species, in 5 days. In a cement pool with a capacity of 900 litres, divided into two parts, 3,700 cc. of a thick mixture of culture and peptone was added to one section. Within a few days the addition of water to this section

caused it to overflow into the adjoining section. Dead snails were observed in both sections in increasing numbers. Thirty days after treatment some 80 per cent. of *Bulinus* and *Planorbis* were dead and also 58 to 100 per cent. of other aquatic snail species with the exception of *Ampullaria* which was unaffected. Further experiments in artificial pools showed that cultures in 2 per cent. peptone were more effective than 1 per cent. peptone or 10 per cent. boiled blood.

The first field experiment was in a 40 m. length of drain 1½ m. wide and ½ m. deep. This was emptied and sprayed with *B. pinottii* culture with 5 per cent. peptone added. Water flowed into this section the next day and the following day 666 snails of various species, including 36 *Bulinus* and 111 *Lymnaea* were collected. They were transferred to clean water and 99 per cent. were found to be dead, including all specimens of the two species mentioned. A similar experiment in which the drain was not first emptied was much less successful. Other field trials with a culture of 20 per cent. blood and the water from a drain containing dead snails yielded inferior results. Three further experiments with cultures and peptone killed a high percentage of the *Planorbis*, *Bulinus* and *Lymnaea* present. The authors recommended the use of such biological methods for the control of *P. boissyi* in Egypt where this species occurs in limited and isolated foci.

[This interesting paper would have been more valuable if the experimental data had been given in full and tabulated. There is no statement as to the concentration of the organism in the treated water. The method does not yet seem to have any advantage over chemical molluscicides.]

[For previous studies by Dias and colleagues, see this *Bulletin*, 1955, v. 52, 797 for further references.] *T. H. Davey*

Moore, D. V. & Meleney, H. E. **Development of *Schistosoma mansoni* in the Peritoneal Cavity of Mice.** *J. Parasitology.* 1955, June, v. 41, No. 3, 235–45, 2 figs.

Mice and hamsters when exposed to similar percutaneous infections by the cercariae of *Schistosoma mansoni* proved equally good hosts, in so far as the rate of development of the worms, the proportion of worms reaching sexual maturity, and the passage of eggs in the faeces were concerned. When, however, similar numbers of *S. mansoni* cercariae were injected into the peritoneal cavities of these two hosts the resulting infections showed certain marked differences. In the case of hamsters nearly all of the worms had escaped from the peritoneal cavity within 14 days and none persisted in this site after 28 days. In the case of mice, which had received the same number of cercariae by the intraperitoneal route, the majority of the surviving young flukes remained in the peritoneal cavity and, in spite of the absence of a blood meal, continued their growth and development in this abnormal situation, some

of the female worms reaching sexual maturity and producing fertile eggs in which miracidia subsequently developed. Worms which had escaped from the peritoneal cavity migrated to the mesenteric portal system and completed their normal development. [In classifying the various stages of helminth development the authors use the Greek alphabet system (originally described by Faust and Meleney, this *Bulletin*, 1925, v. 22, 468), and each page of their manuscript contains many statements expressed in terms, of which the following is a sample: "The worms from the animals sacrificed at 56 and 70 days were in similar developmental stages. The intraperitoneal worms ranged from *rho* to *upsilon* with a majority classified as *tau* and *upsilon*. The extraperitoneal worms were classified as ranging from *tau* to *omega*, the majority being sexually mature (*chi* to *omega*). The classification of some of the worms in the stages *tau* through *phi* may be attributed to the fact that these animals harbored excess male worms which were slightly smaller than the males paired with females." In the opinion of the abstracter this system is wasteful of space, pretentious (in that it implies a universal acquaintance with the Greek alphabet) and possesses no obvious advantages over a simple numerical or alphabetical system employing the same language as that in which the paper is written.] *R. M. Gordon*

Kagan, I. G. **Studies on the Serology of Schistosomiasis. I. The *in vitro* Activity of Cercariae and Miracidia in Serum of Experimental, Natural, and Immunized Hosts.** *Exper. Parasit.* New York. 1955, July, v. 4, No. 4, 361–76, 4 figs. on pl. [16 refs.]

The "*cercarienhüllenreaktion*"—commonly called the "CHR reaction" described by Vogel and Minning [this *Bulletin*, 1949, v. 46, 1154; 1950, v. 47, 635] is now well recognized as a laboratory method of diagnosing schistosome infections. More recently Senterfit [*ibid.*, 1954, v. 51, 401] has reported that the miracidia of *S. mansoni* when added to the inactivated sera of infected hamsters or monkeys become immobilized, whereas, if they are exposed for the same period of time to normal sera, they remain unaffected. In the present paper, "the *in vitro* response of cercariae and miracidia of *Schistosoma mansoni* and *Schistosomatium douthitti* was studied in immune serum of experimentally infected monkeys, human serum from naturally infected persons, and rabbit serum after immunization with antigens prepared from stages in the life cycle of *S. mansoni* and *S. douthitti*. *In vitro* tests with miracidia were conducted with normal sera of 15 vertebrate hosts. Studies were also made to determine the interval in days after exposure that antibody could be detected in the serum of hosts utilizing *in vitro* techniques".

The author considers that both "the CHR and miracidial immobilization test appear to be sensitive *in vitro* techniques for the detection of antibody in sera of experimental, immunized, and naturally infected hosts.

Cross reactions with cercariae of two genera of schistosomes indicate little specificity within the family of schistosomes. Whether the antibodies responsible for the CHR and miracidial immobilization test are associated with resistance and protection of the host is difficult to test experimentally, since passive transfer of immunity in schistosomiasis has not been successfully demonstrated ''. The authors conclude that for the detection of antibody in infected animals, or in animals previously immunized with antigens, the miracidial immobilization test is more sensitive than the CHR. [This paper contains much detailed information which does not lend itself to further summarization and the original should be consulted by those interested.] *R. M. Gordon*

Deschiens, R. & Lamy, L., with the technical collaboration of H. Lamy. Note pratique sur les infestations occultes à *S. mansoni* dans les bilharzioses expérimentales. [**Practical Observations on Occult Infections by** *Schistosoma mansoni* **in Experimental Schistosomiasis**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 1, 38–40.

The following is a translation of the authors' summary:—

Three cases are recorded of scanty, occult monosexual infections by *S. mansoni* in the golden hamster and attention is drawn as a practical matter to the need in experimental studies on *S. mansoni* infections to avoid confining the investigation to stool examination for the purpose of checking the presence or absence of infection of the animals, but always to perform a methodical autopsy including complete dissection of the spleen and exploration of the mesenteric veins.

H. J. O'D. Burke-Gaffney

Bauman, P. M., Berrios-Duran, L. & McMullen, D. B. **Effectiveness of Abbott's Insect Repellent Cream (E 4856) as a Protective Barrier against** *Schistosoma mansoni* **in Mice.** *J. Parasitology.* 1955, June, v. 41, No. 3, 298–301. [12 refs.]

Abbott's Insect Repellent Cream (E 4856) is an odourless, colourless preparation containing 2 per cent. Rutgers 612, 2 per cent. Indalone, and 6 per cent. dibutyl phthalate in a plasticized compound of silicone, nitrocellulose and castor oil in a vanishing cream base. Under laboratory conditions, of which a very full and exact description is recorded in the original paper, this cream '' served as an effective barrier against penetration of cercariae of *S. mansoni* in mice when applied to the skin surface. The protection was essentially absolute for 12 hours and was marked over a 24 hour period. Evidence of protection persisted in one series of animals for 3 days despite hour-long soakings in water on three consecutive days. There was no apparent protection after 72 hours ''.

R. M. Gordon

Standen, O. D. **The Treatment of Experimental Schistosomiasis in Mice: Sexual Maturity and Drug Response.** *Ann. Trop. Med. & Parasit.* 1955, June, v. 49, No. 2, 183–92, 3 graphs & 1 fig. on pl. [10 refs.]

It has been shown [this *Bulletin*, 1949, v. 46, 481] that immature schistosomes are less susceptible to the action of drugs than mature forms. A series of *p*-aminodiphenoxyalkanes previously described [*Trans. Roy. Soc. Trop. Med. & Hyg.*, 1954, v. 48, 446; this *Bulletin*, 1955, v. 52, 997] which are highly lethal to schistosomes have been used to compare the efficacy of treatment with maturity of the schistosomes. Mice were infected percutaneously with approximately 130 cercariae of an Egyptian strain of *S. mansoni*. Groups of mice were treated with primary, secondary and tertiary amines of the above series as well as with tartar emetic orally for 3 days with daily amounts of 200 and 35 mgm. per kgm. respectively. Autopsies were carried out 65 days after infection on treated and untreated hosts and the hepatic portal systems examined to determine the extent of migration of worms to the liver, the number which survived and their general distribution. It was found that tartar emetic possessed about one-seventh of the activity of effective members of the alkane series.

The effect of one of this group on unisexual male and female infections was tested and the character of the response noted on superimposing an infection of the opposite sex. It was found that schistosomes under 28 days old were not affected by the drug, but from 35 to 56 days after infection the efficacy of the drugs increased. Unisexual infections with female forms were unaffected by the drug up to 173 days of age. Similar unisexual infections with male forms responded like bisexual infections. The author concludes that only sexually mature *S. mansoni* are affected by drugs and the mature type of infection is therefore necessary in drug testing. Two courses of treatment, 4 weeks apart, should prove beneficial in treating human infections by making sure that worms which were immature at the start of treatment come in contact with the drug at maturity. *J. D. Fulton*

Schwetz, J. Infection expérimentale d'un rat de maison (*Rattus rattus*) et d'un rat sauvage (*Mastomys coucha*) par *Schistosoma rodhaini*. [**Experimental Infection of a House Rat** (*Rattus rattus*) **and a wild rat** (*Mastomys coucha*) **with** *Schistosoma mansoni*] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 2, 180–82.

For identifying cercariae from planorbid snails and *Physopsis* the author used, during his investigations in various parts of Central Africa, white mice, which are small, easily managed, can be carried about and are very susceptible to infection. With them he has made differential diagnoses

between *Schistosoma mansoni* and *S. rodhaini* among the cercariae found in planorbid snails, and between *S. haematobium* and *S. bovis* among cercariae found in *Physopsis*; with these mice he also rediscovered *S. rodhaini* at Elisabethville in 1950. But he has had several disastrous epidemics among the mice and often found himself without any left for experiments. He then had the idea of using wild rats instead and a chance encouraged him to do this. He caught at Albertville, in 1952, near the river Kaomba, an albino *Mastomys coucha* and infected this, and at the same time 2 white mice, with cercariae from 2 planorbid snails. The mice died prematurely, but in the *Mastomys* the author found on the 53rd day after infection, eggs of *S. mansoni*.

Wishing to send to Brussels a strain of *S. rodhaini*, the author collected, in a marsh near Lake Tanganyika, 382 *Planorbis* [*Biomphalaria*] *tanganikanus*, 18 of which liberated schistosome cercariae. This marsh had previously provided planorbids parasitized by *S. rodhaini* and the author was almost sure that the cercariae liberated were of this species; but proof was lacking and, having no white mice available, he exposed on December 20, 1954 a young *Mastomys coucha* from the banks of the river Ntete and a young *Rattus rattus* from a house to liquid containing the cercariae from the *P. tanganikanus*. The faeces of these rats contained, 40 days later, numerous eggs of *S. rodhaini*. The 2 rats were killed on February 3, 1955 and numerous eggs were then found in the liver and numerous adult flukes in the mesentery, especially in the *Mastomys*.

Earlier the author [this *Bulletin*, 1954, v. 51, 604] had found *Mastomys coucha* rarely infected naturally with both *S. rodhaini* and *S. mansoni* (var. *rodentorum*). The results recorded above show that *M. coucha* can serve experimentally as the intermediate host of *S. mansoni* and *S. rodhaini*. *Rattus rattus* is also rarely a natural intermediate host of *S. mansoni* [see Schwetz, below] and a good experimental host of *S. rodhaini*. To complete the study it remains to find a *Rattus rattus* naturally infected with *S. rodhaini* and another which has served experimentally as the intermediate host of *S. mansoni*. *G. Lapage*

Schwetz, J. Sur l'infection naturelle des rats domestiques (*Rattus rattus*) par *Schistosoma mansoni* en Afrique Centrale. [**Natural Infection of House Rats** (*Rattus rattus*) **with** *Schistosoma mansoni* **in Central Africa** (Preliminary Note)] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 2, 182–5, 2 pls.

Formerly *Schistosoma mansoni* was thought to be a parasite of man only, but de Amorim *et al.* [this *Bulletin*, 1954, v. 51, 403; 1267] found 5 wild rats naturally infected with this species and Schwetz [*ibid.*, 1954, v. 51, 604] found 4 wild rats in the Lake Tanganyika region naturally infected. Simoes Barbosa *et al.* (*Publicaçaos avulsas do Instituto Aggeu Magalhaes*, Recife, 1953, v. 2, 4) found natural infection of *R. rattus*.

Although the wild rats of America are different from those of Africa, the domestic rats are the same, *R. rattus*. Barbosa *et al.* (*loc. cit.*) gave the present author the idea of examining African rats. At Albertville he examined 122 *R. rattus* and found natural infection in 2 only (1·6 per cent.).

These 2 infected rats both came from a group of 3 houses near the confluence of the rivers Kapemba and Lukuga, where infected planorbid snails had previously been found by the author, and of 33 rats examined here 6 per cent. were infected. The incidence of the infection in house rats thus varies in different localities, just as the incidence in wild rats varies, as the author noted (*loc. cit.*) in different river valleys, in some of which there were no infected rats, while in others infected rats were more or less numerous, in spite of the fact that infected planorbid snails were present in all these valleys. In the paper cited above the author also noted that the eggs of *S. mansoni* found in parasitized wild rats were abnormal and he therefore gave the name *S. mansoni* var. *rodentorum* to this species that produces abnormal eggs in wild rats. The eggs found in the house rats were, on the other hand, typical as the photographs in the present paper show. *G. Lapage*

Edwards, D. K. & Jansch, Marjorie E. **Two New Species of Dermatitis Producing Schistosome Cercariae from Cultus Lake, British Columbia.** *Canadian J. Zool.* 1955, June, v. 33, No. 3, 182–94, 7 figs. [10 refs.]

"Two new schistosome cercariae capable of producing a dermatitis are described: *Cercaria columbiensis*, n.sp. and the cercaria of *Trichobilharzia adamsi*, n.sp. A female adult of *T. adamsi* n.sp. is also described."

Bearup, A. J. **A Schistosome Larva from the Marine Snail** *Pyrazus australis* **as a Cause of Cercarial Dermatitis in Man.** *Med. J. Australia.* 1955, June 25, v. 1, No. 26, 955–60, 3 figs. [14 refs.]

The occurrence of schistosome dermatitis as a result of bathing in sea water—as distinct from fresh water—was not recorded until 1950 [this *Bulletin*, 1951, v. 48, 172; 1952, v. 49, 1058] since when cases have been reported from such widely separated places as California, Florida, Rhode Island, Hawaii and, now, Australia. In consequence, the subject has become of some practical importance, and the author of the present paper not only gives a full account of the morphology of the cercaria and of the lesions resulting from its penetration of the skin but in addition he reviews the literature concerning the occurrence of both freshwater and sea-water cercarial dermatitis in Australia. The summary is as follows:—

"A schistosome cercaria from the marine snail *Pyrazus australis* has been shown to cause cercarial dermatitis in man. The cercaria is present

in about 3% of these snails from Narrabeen Lake. The dermatitis follows a course similar to that already described for cercarial dermatitis due to non-human schistosomes in North America and elsewhere.

"The morphology, habitat and general behaviour of the cercaria resemble closely those of *C. variglandis* (Miller and Northup), and the cercaria has been provisionally named as a subspecies *pyrazi*.

"Adult worms have been recovered from experimental infections in silver gulls, pigeons and budgerigars; they closely resemble *Austrobilharzia terrigalensis* Johnston, 1917. . . ." *R. M. Gordon*

Kuhlow, F. Untersuchungen über die Entwicklung des Breiten Bandwurmes (*Diphyllobothrium latum*). [**Researches on the Development of the Broad Tapeworm** (*Diphyllobothrium latum*)] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, June, v. 6, No. 2, 213–25. [Numerous refs.]

The author tested the susceptibility of various fish to infection with the procercoids and plerocercoids of *Diphyllobothrium latum*. The original material was plerocercoids obtained from the burbot (*Lota lota*) from the Elbe, in which the author found that the incidence was higher than that previously recorded, the plerocercoids being found not only in the digestive tract but also in the oesophagus, stomach, pyloric caeca, liver, spleen, muscles, body cavity, swim-bladder and the wall of the gall bladder. As experimental animals the author used the rainbow trout (*Trutta shasta*) and the pike (*Esox lucius*), his methods being those used by him (*Ztschr. f. Parasitenk.*, 1953, v. 16, 1) in his work on *Diphyllobothrium dendriticum*. Fish can infect themselves in two ways: (1) by eating copepods containing procercoids, the procercoids then developing in the fish into plerocercoids, so that the fish are true intermediate hosts; (2) by eating fish containing plerocercoids, the plerocercoids not developing further in the fish, so the fish are then not true intermediate hosts but transport hosts.

The author found that procercoids given *per os* to the ruff (*Acerina cernua*) and the pike (*Esox lucius*) developed into plerocercoids and that plerocercoids given *per os* to *A. cernua*, *E. lucius*, *Leuciscus rutilus* [the roach], *Perca fluviatilis* [the perch] and the rainbow trout, *Trutta shasta*, established themselves in these fish. Thus *A. cernua* and *P. fluviatilis*, known only as intermediate hosts, can also act as transport hosts. The success of the infection of *L. rutilus* and also of *Rana esculenta* and *Xenopus laevis* (by intraperitoneal or subcutaneous infection) suggests that there are yet other transport hosts not naturally infected because they do not get the opportunity to take up plerocercoids. One plerocercoid 105 days old from *A. cernua* swallowed by the author developed in him to the tapeworm stage, eggs being found in the stools 18 days after infection; but the worm died a few days later, perhaps because earlier

infections had rendered the author resistant. Plerocercoids from *A. cernua* did not develop to the tapeworm stage in the dog, but a 62-day-old plerocercoid from the pike did, eggs being found in the faeces of the dog 16 days after infection.

The time required for the development of the plerocercoid of *D. latum* to the infective stage was shown to be 2½ months in the pike and 3½ months in the perch. Possibly it can occur in these fish quicker than this; in carnivorous fish it may usually be quicker.

The author appraises 49 experiments of his own on the part played by the dog in the dissemination of *D. latum*, and also the work of others, and he concludes that the dog is less important than man as a final host, but can be important as a means of dissemination of *D. latum*. Other natural final hosts are foxes, cats, bears, pigs and other mammals. For details the original paper must be read. *G. Lapage*

Neghme, A. & Silva, R. Algunas observaciones epidemiológicas sobre *Hymenolepis nana* en Chile. [**Epidemiological Observations on *Hymenolepis nana* in Chile**] *Bol. Laboratorio Clinica "Luis Razetti"*. Caracas. 1955, Apr., v. 16, Nos. 43–44, 615–20. [11 refs.]

The authors state that *Hymenolepis nana* is the commonest source of taeniasis in Chile. They show in a table that it occurs widely between latitudes 18·5° to 55° in people of all ages in 108 localities. The table gives data for 5 zones, from north to south, and indicates that *H. nana* was found in 1,371 (7·96 per cent.) of 17,219 persons since 1949. It was commonest in the 3 zones between 18° and 38°, where the respective percentages were 8·28, 9·64 and 12·23, and the highest degree of infection (7·33 to 9·32 per cent.) was in children of 1 to 14 years.

The authors attribute this high incidence to the higher temperatures in the northern and central areas, and to the overcrowding, bad sanitation and prevalence of rats there. In the Santiago area, *H. nana* var. *fraterna* was found in 10 of 128 rats (7·81 per cent.).

Another table indicates an inverse correlation between the prevalence of *H. nana* and of *Ascaris* and *Trichuris* in the extreme north and south, but the authors share the opinion of Otto [this *Bulletin*, 1936, v. 33, 562, 563] that the mechanism of transmission of *H. nana* is similar to that of *Ascaris* in that both occurred most frequently at school age.

H. J. O'D. Burke-Gaffney

Taiana, J. A., Schieppati, E., Aracama Zorraquin, V. A. & Lacour, G. A. Equinococosis pulmonar. Tratamiento quirúrgico de 212 quistes. [**Surgical Treatment of 212 Echinococcus Cysts of the Lung**] *Rev. Facul. Ciencias Méd. de Buenos Aires*. 1955, Jan.–Mar., v. 2, No. 1, 29–40. [15 refs.] English summary (8 lines).

Pattanayak, G. C. & Thomas, S. **Acute Intestinal Obstruction due to *Ascaris lumbricoides*.** *J. Indian Med. Ass.* 1955, Sept. 1, v. 25, No. 7, 275.

The authors, from Orissa, describe the case of a child aged 5 who suffered from abdominal pain, diarrhoea and constipation for a month. A week before admission, santonin was given and 48 roundworms were vomited in 24 hours and thereafter small numbers were vomited.

On admission, the child was acutely ill, with pain, distension, visible peristalsis but no vomiting or rigidity. After 4 days of ineffective conservative treatment, the child was given diethylcarbamazine for 6 days in syrup form. Thereafter bundles of live, and later dead, roundworms were passed, 200 in all. The child was discharged in 2 weeks, but 5 days later *Ascaris* ova were still present in the stool and the treatment was repeated. Only 3 worms were passed within the next week.

Although ascariasis causes intestinal obstruction, it is not often so acute. The authors do not recommend surgical interference or santonin therapy, and suggest that even in heavily infected persons diethylcarbamazine seems to be the drug of choice, particularly in the form of the elixir. *H. J. O'D. Burke-Gaffney*

Katayama, Y. [**Sanitary Treatment of Human Excreta by Heating Process. 16. Effect of the Treatment applied to a Farm-Village (Part 1)**] *Japanese J. Nation's Health.* 1955, Apr., v. 24, No. 1, 1–12, 13 figs. [In Japanese.]

The English summary appended to the paper is as follows:—

"A simple method of heat treatment of human excreta used as fertilizer has been devised and put into practice since 1952 at Kashiwabara-mura, a farm-village in Shiga Prefecture, as the radical countermeasure for parasitic disease control.

"A sheet-iron container with a capacity of 14 litres was installed under the seat of each domestic privy to receive faecal excrement only. The faecal content is emptied occasionally into a drum-can of 20 or 200 litres in capacity, and heated up to 60°C. with fire-wood. All parasite ova, pathogenic bacteria of digestive organs and fly-maggots are completely destroyed thereby, and then the night-soil is used for fertilization.

"The effect of excreta treatment by heating process has been clearly demonstrated by a striking decline in the prevalence and incidence rates of ascaris and hookworm infection, as well as by a marked decrease in the count of embryonated ascaris ova found in the farm-soil of the village as compared with the contrast in the adjacent village."

Jordan, P. **Observations on *Wuchereria bancrofti* and *Acanthocheilonema perstans* in Tanganyika.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 460–71. [33 refs.]

This paper is based upon surveys made by the Filariasis Research Unit and East African Survey Organizations of the East Africa High Commission. The work occupied 3 years between 1951 and 1954 [this *Bulletin*, 1954, v. 51, 1180].

Nearly 150 villages in Tanganyika were visited in order to determine the incidence and distribution of *Wuchereria bancrofti* and *Dipetalonema perstans* infections. In some cases, owing to local objections, the taking of blood films at night and the examination of the genitalia had to be abandoned. The people were told that the team was investigating elephantiasis, but for survey purposes the incidence of genital filariasis is thought to be more accurate than that of elephantiasis because elephantiasis of the legs and hydrocele are not generally associated with each other by Africans. The term " microfilaraemia rate " of a village denotes the percentage of males over the age of 16 years with microfilariae in their blood. " Hydrocele rate " denotes the percentage of adult males with genital filariasis and " elephantiasis rate " that of adults with elephantiasis of the legs.

Bancroftian infection in Tanganyika was found in 3 main foci. An extensive coastal area of infection extends up the main river valley and covers most of the low-lying Southern Province. A second area extends southwards from the southern end of Lake Victoria, and the third is a small but heavily infected focus at the northern end of Lake Nyasa. It became apparent that the lower microfilaraemia (5–30 per cent.) and clinical rates occur with lower temperature and vapour-pressure readings, whereas the high rates (31+) are associated with high temperatures and vapour pressures.

Probably the most important factor on the human side of the filarial cycle influencing the infection rate in an area is the density of the population at risk, together with the application or otherwise of anti-mosquito measures.

In Tanganyika bancroftian filariasis was rarely found in places above 4,000 to 4,500 ft. In the *W. bancrofti* and *D. perstans* infections males are more frequently infected than females. The figures are statistically significant. (They are: for *W. bancrofti* in children 4·4 per cent., for *D. perstans* 16·9 per cent.; for adult males 19·6 and 37·8 per cent. respectively; for adult females 13 per cent. and 21·4 per cent.). The differences cannot, as in the Pacific, be connected with the character of the employment, but may be related to susceptibility. Statistics collected indicate that in *D. perstans* infection microfilaraemia is more frequent in children than in the case of *W. bancrofti*. The explanation for this is not apparent.

In most areas where bancroftian microfilaraemia was found, elephantiasis was also seen. Since it was found impossible to differentiate between bancroftian and non-bancroftian types of elephantiasis it is unwise to assess the occurrence of the infection on the presence of elephantiasis alone. Night blood samples were taken from 259 persons

with elephantiasis and microfilariae were present in 5·6 per cent. of 144 with unilateral disease. Elephantiasis of the arm was seen in 7 cases, and genital filariasis was often associated with elephantiasis of the legs. Although elephantiasis is usually considered the most important late manifestation the figures indicate that in Tanganyika it is of little importance when compared with the very high incidence of hydrocele. Elephantiasis of the scrotum was seen 16 times and lymph scrotum only 3 times.

During these investigations the glandular condition of Africans was examined in cases of microfilaraemia, of hydrocele with and without microfilariae, in cases of elephantiasis with negative blood, and in controls from endemic and non-endemic areas. Any gland considered by the examination to be larger than normal has been included, while cases of scabies and tropical ulcer have been excluded. The nomograms constructed from the figures are in agreement with Buxton's work [this *Bulletin*, 1929, v. 26, 436] and go to show that though a high incidence of epitrochlear glandular enlargement has been noted in persons with microfilaraemia and elephantiasis, it is not considered diagnostic in E. Africa [see also Edeson, below]. Although pathological changes in lymph glands are usually associated with adult filarial worms, yet they may result from small eosinophilic abscesses due to presence of microfilariae [this *Bulletin*, 1950, v. 47, 861].

The incidence of *D. perstans* has been determined as being more extensive than had been recorded, especially in the Southern Province where numbers of patients have a dual infection with *W. bancrofti* [this *Bulletin*, 1955, v. 52, 808, 918]. As pointed out by Christy in 1903 *D. perstans* is frequent where bananas are grown, and where *Culicoides* breeds, but in the area north of Lake Nyasa, where bancroftian filariasis is hyperendemic, bananas are abundant and *D. perstans* absent.

Three groups of villages were used in a further study—those with *D. perstans* rates of less than 20 to 40 per cent. and those with rates of 41 per cent. and over. The mean temperatures and vapour pressures showed no consistent variation in the 3 groups, but the mean rainfall figures decreased steadily with the higher microfilaraemia rates which suggests that one of the reasons for the absence of *D. perstans* from some of the areas where apparently suitable conditions prevail may be that excessive rainfall occurs in these areas. No proof was obtained that tsetse flies may sometimes be vectors of *D. perstans*, but the suggestion is made that they may act as such. *Philip Manson-Bahr*

Subramoni, V. R. **A Preliminary Note on the finding of Filarial Nematodes in *Culex fatigans* (Wied) in Bombay Suburbs.** [Research Notes.] *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1955, July, v. 3, No. 4, 122.

The occasional cases of filariasis seen in Bombay have been considered to have been imported from outside. In 1950, certain suburban areas

were merged in the greater Bombay municipality and thereafter 662 specimens of *Culex fatigans* were dissected by the Insecticides Branch. Filarial nematodes in various stages were found in 16 and "relevant slides" sent to the Malaria Institute of India indicated the presence of "sausage" forms of filarial nematodes. This is believed to be the first record in greater Bombay of *C. fatigans* infected with filarial nematodes.

H. J. O'D. Burke-Gaffney

Hernández Pieretti, O. Nuevo foco filariano comprobado en Venezuela entre indios Uiniquinas y Guarunos del Territorio Federal Delta Amacuro. Nuevos casos de infestación por *Mansonella ozzardi*, y primeros casos de Acanthocheilonemiasis señalados en Venezuela. [**New Focus of Filariasis in Venezuela. New Cases of** *Mansonella ozzardi* **and First Cases of** *Dipetalonema* **Infections in Venezuela**] *Gac. Méd. de Caracas.* 1955, Jan.–Feb., v. 62, Nos. 1/2, 39–51, 3 figs. [30 refs.]

Bhaduri, N. V. & Chowdhury, A. B. **Microfilarial Periodicity.** *Indian Med. Gaz.* 1954, Oct., v. 89, No. 10, 594–8. [Numerous refs.]

A review of the literature.

Edeson, J. F. B. **Clinical Diagnosis of Filariasis.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 488–9.

While enlargement of lymphatic glands is regarded as a common sign of *Wuchereria bancrofti* infection, the significance of this sign is open to doubt and the clinical diagnosis is still unsatisfactory.

The author therefore examined 91 children under the age of 5 in East Pahang, Malaya, where the microfilaria rate is 36 per cent. and 122 children in Selangor where filariasis is not known to occur. The results are shown in a table which indicates that the percentage having enlarged inguinal, epitrochlear and axillary glands, respectively, in Selangor were 82, 48 and 16 and in East Pahang 88, 53 and 31. Evidently only the difference between the groups in regard to enlarged axillary glands is significant: and even this is obscured by the frequent presence of such enlarged glands in the area free from filariasis. No obvious difference was found in the size and consistency of the glands in the two groups. Septic sores and scabies were very common and yaws is prevalent in both areas. The author therefore considers lymphatic gland enlargement valueless for clinical diagnosis of filariasis among young children in Malaya.

For similar reasons, it is unlikely to be of value in adults, among whom the incidence of sepsis is high: but this value has not yet been assessed.

H. J. O'D. Burke-Gaffney

Westbrook, Mary G. & Scott, J. A. **A Statistical Analysis of the Growth in Length of the Filarial Worms in the Cotton Rat.** *Texas Reports on Biol. & Med.* 1955, v. 13, No. 3, 537–58, 5 figs. [20 refs.]

"In summary, few specific conclusions can be drawn from a study of this type but the method of the general analysis should provide a basis for future studies of the growth of parasites. The results of the analysis of variability should serve as a warning to parasitologists working with any phase of parasitic growth. The parasitologist must keep in mind the fact that the variation which he observes in his samples could very well be due to the influence of the host on the parasite and not just due to random variation of the parasite itself."

Lea, A. O., Jr. & Dalmat, H. T. **A Pilot Study of Area Larval Control of Black Flies in Guatemala.** *J. Econom. Entom.* 1955, Aug., v. 48, No. 4, 378–83, 3 figs.

"A small-scale area larviciding program was conducted in a region of Guatemala, known to be endemic to human onchocerciasis, to determine the feasibility of control of the adult black flies that serve as vectors of the disease. In the area of about 80 square miles which was included in the program, 1500 breeding streams were surveyed, treated, and retreated at intervals over a 3-month period.

"The larvicide program was begun by following each of the main streams in the area downstream from its source, and systematically searching for all tributaries, determining their volume and treating them. Records of stream volumes were kept, so that by the time the streams were reinfested (21 days) retreatment was simplified.

"The volume of 85% of the breeding streams was less than 100 gallons per minute. Such small rivulets were generally short enough so that one treatment at their source with DDT at 0·1 p.p.m. for 3 minutes sufficed to rid them of larvae. Long rivulets and streams up to 5000 gallons per minute and larger were given the same treatment at intervals along the stream's course. Streams with a flow greater than 5000 gallons per minute, which were inaccessible to the more frequent treatments at intervals, were given either DDT at 2 p.p.m. for 3 minutes or 0·1 p.p.m. for 60 minutes, the longer treatment being effective for a greater distance.

"During the same period, and for 3 additional months, eight collecting stations were maintained to sample the adult black fly population and to note fluctuations due to the larvicidal treatments. Although the larviciding was carried on for a relatively short period, it was demonstrated that the adult biting population was depressed during that time.

"On the basis of this pilot study, recommendations and estimated costs were given for a vector control campaign in a 100-mile area. The total endemic onchocerciasis region in Guatemala is considered to be 600 square miles."

Yamaguchi, T., Ijima, Y., Fujioka, S. & Murakami, K. [*Gnathostoma* **from Wild Fowls in Shikoku Island**] **(II).** *Shikoku Acta Med.* 1955, June, v. 6, No. 6, 33–4. [In Japanese.] English summary.

Biguet, J., Coutelen, F., Deblock, S., Doby, J. M. & Mullet, S. Étude de l'activité de la pipérazine dans l'oxyurose. [**Activity of Piperazine in Enterobiasis**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 1, 40–46, 1 fig. [13 refs.]

The following is a translation of the authors' summary:—

We have observed that at the high but perfectly tolerated dosage of 60 to 80 mgm./kgm. daily, in two courses of a week each, piperazine hydrate is remarkably active in enterobiasis in children: these results confirm those obtained by White and Standen in 1953 [this *Bulletin*, 1954, v. 51, 86, 423]. *H. J. O'D. Burke-Gaffney*

Chan, K. F. **The Distribution of Larval Stages of** *Aspiculuris tetraptera* **in the Intestine of Mice.** *J. Parasitology.* 1955, Oct., v. 41, No. 5, 529–32, 1 graph. [11 refs.]

"The distribution of larval stages of *Aspiculuris tetraptera* in the intestine of infected mice has been described, and a preliminary downward migration followed by an upward migration of the immature stages is reported. This migration is perhaps of importance in experimental chemotherapy of *Aspiculuris*."

Boecker, H. & Erhardt, A. Chemotherapeutische Untersuchungen an den natürlichen Oxyureninfektionen der Maus zur Testierung von Oxyurenmitteln. [**Chemotherapeutic Studies on the Natural Oxyurid Infections of the Mouse as a means of testing Remedies for Oxyurid Infections**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1955, June, v. 6, No. 2, 198–206. [26 refs.]

The authors summarize the literature on the effects of various drugs on *Syphacia obvelata* and *Aspiculuris tetraptera*, parasitic in mice. They ask whether these natural infections of mice can be used to discover remedies for enterobiasis, in the same way as infections of rabbits with *Passalurus* can. Substances effective against mouse species must also be effective against human species; substances effective in man must have basically the same effect in mice and in man at the same dose; and both hosts must be equally tolerant of them. The authors describe their tests, done on this basis, of piperazine hydrate, crystal violet, phenothiazine, Egressin, hexylresorcinol, tetrachlorethylene and santonin on *Syphacia obvelata* and *Aspiculuris tetraptera* of mice. All the drugs were

given orally and in one dose only. Two effects were tested, namely, the expulsion of worms caused and the cure of the infections. The authors found that mice expelled, without any treatment, 3 per cent. of their *Aspiculuris* and 26·9 per cent. of their *Syphacia* over a period of 4 days and concluded that a drug can be effective only if it expels more worms than these. Tables give the doses of the drugs used and the results.

The effects on *Aspiculuris* infections were as follows. Judged by the percentages of worms expelled, piperazine hydrate (1 gm./kgm.) had a strong effect, hexylresorcinol a distinct effect, tetrachlorethylene a doubtful effect and phenothiazine, Egressin, santonin and crystal violet no effect. Judged by the cures effected, the results were the same, except that crystal violet had a doubtful effect.

The effects on *Syphacia* infections were as follows. Judged by the worms expelled piperazine hydrate (1 gm./kgm.) and hexylresorcinol had a strong effect, phenothiazine, tetrachlorethylene, Egressin and crystal violet a doubtful effect and santonin had no effect. Judged by cures effected, piperazine hydrate and hexylresorcinol had strong effects, santonin (in contrast to its lack of efficacy in oxyurid infections of man and rabbits) and Egressin a distinct effect and tetrachlorethylene, phenothiazine and crystal violet a doubtful effect.

The authors conclude that, although *Passalurus* infections of rabbits can be used to test drugs for human enterobiasis, oxyurid infections of mice cannot be. The doses of drugs required to cure mice are considerably higher than those effective for *Passalurus* infections of rabbits, and these doses killed a higher percentage of mice. A table compares the effects of the drugs tested on *Passalurus* infections of rabbits and on *Syphacia* infections of mice and it shows that the doses given to rabbits correspond to those given to cure enterobiasis of man. Oxyurid infections of mice are, nevertheless, suitable to a limited degree for finding new drugs for the treatment of enterobiasis. *G. Lapage*

Gould, S. E., Gomberg, H. J., Bethell, F. H., Villella, J. B. & Hertz, C. S. **Studies on *Trichinella spiralis*. I. Concerning the Time and Site of Insemination of Females of *Trichinella spiralis*. II. Time of Initial Recovery of Larvae of *Trichinella spiralis* from Blood of Experimental Animals. III. Effect on the Intestinal Phase of Trichinosis of Feeding Massive Numbers of Irradiated Trichina Larvae. IV. Effect of Feeding Irradiated *Trichinella* Larvae on Production of Immunity to Re-Infection. V. Tests for a Strain of Trichina Larvae resistant to Radiation.** *Amer. J. Path.* 1955, Sept.–Oct., v. 31, No. 5, 933–63, 6 figs. on 3 pls. & 3 text figs. [16 refs.]

The following quotations from the authors' various "summaries" and "conclusions" cover the main points, but the original papers should be

consulted for descriptions of the techniques used, and for the discussions concerning these and previous observations.

I. "The findings indicate that insemination occurs as early as 30 hours after feeding. Our evidence suggests that during insemination a large portion of the adult male (except the posterior end) and the anterior end of the female adult are imbedded in the mucosa of villi, the cloacal portion of the male and the vulval portion of the female lying exposed between adjacent villi. Insemination of females apparently may occur more than once."

II. "Twenty-nine adult white rats, 5 rabbits, 4 dogs, and 4 rhesus monkeys were infected with counted numbers of excysted Trichinella larvae. At various intervals ranging from 96 to 168 hours after infection, specimens of venous or cardiac blood were examined for first stage larvae. In the rat and rabbit, first stage Trichinella larvae were recovered earliest at 114 hours after negative results at 110 hours; in the dog and monkey, larvae were recovered earliest at 120 hours after negative results at 117 hours."

III. "White rats fed 12,000 non-irradiated excysted larvae of *T. spiralis* (48 to 60 larvae per gm. of body weight) died, apparently mainly as a result of the intestinal phase of the infection. The feeding of the same number of larvae that had been exposed to 10,000 r. cobalt-60 merely caused transient diarrhea in some animals. The feeding of 12,000 larvae or of 24,000 larvae that had been exposed to 18,000 r. cobalt-60 generally (in 19 of 20 rats) caused no diarrhea and permitted the animals to gain steadily in weight.

"In all rats fed irradiated larvae (10,000 r. or 18,000 r.), the parasites were lost rapidly from the intestinal tract.

"It is inferred, therefore, that if a person were to eat raw or undercooked, heavily trichinosed pork that was irradiated in all parts with at least 18,000 r. cobalt-60, he would suffer little or no ill effect from irritation of the intestine by the larvae, and that the parasites would disappear rapidly from the intestinal tract."

IV. "Rats fed larvae of *T. spiralis* that have been exposed to 10,000 r. cobalt-60 (a dose of radiation that does not prevent the larvae from developing into adult forms but does result in partial or complete sexual sterilization of the adult worms), develop a definite degree of immunity to re-infection with non-irradiated larvae. If the dose of irradiation with cobalt-60 is increased to 18,000 r. (a dose that prevents most larvae from maturing to adult forms), little or no immunity results."

V. "Larvae of *Trichinella spiralis* were exposed to cobalt-60 in a dose (10,000 r.) that causes sexual sterilization of most of the developing adult worms and in a dose (18,000 r.) that prevents most of them from developing to adult forms. Exposure of larvae to these doses of irradiation with cobalt-60 does not induce in them the property of radioresistance, nor is there evidence that the progeny of those capable of reproduction have become a radioresistant strain." *R. M. Gordon*

Kalapesi, R. M. & Rao, S. R. *Trichinella spiralis* **Infection in a Cat that died in the Zoological Gardens, Bombay.** *Indian Med. Gaz.* 1954, Oct., v. 89, No. 10, 578–80, 9 figs. on 5 pls.

"In this small paper, a record of *Trichinella spiralis* infection which is a rare infection of man and animals in this country is made. A plea for thorough and efficient meat inspection in this country as well as thorough cooking by the consumers is made, so that the infection can be stamped out, before it becomes a serious public health problem. This is the second record of the incidence of trichinosis in a cat in this country, besides those found in a pig in Northern India and the presence of the infection in the squirrels at Lucknow."

[See this *Bulletin*, 1942, v. 39, 782.]

DEFICIENCY DISEASES

Holmes, E. G., Stanier, M. W. & Thompson, M. D. **The Serum Protein Pattern of Africans in Uganda: Relation to Diet and Malaria.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, July, v. 49, No. 4, 376–84, 1 fig. [21 refs.]

Serum protein determinations were made on adults and children in 3 different regions of Uganda. In all, for adult men the mean levels of albumin (3·35, 3·61 and 3·90 gm./100 ml.) were lower than a mean for Europeans (4·59) and the mean levels of gamma globulin (2·42, 2·95 and 1·87 gm./100 ml.) were higher than a mean for Europeans (0·97). The figures for the 3 groups do not suggest any relationship with either the quantity or the quality of the dietary protein. There does, however, appear to be a relationship between the levels of gamma globulin and the incidence of malaria. If this relationship is a causal one, then the humoral element of malarial immunity in man may be a gamma globulin, or the hypertrophy of the lymphoid-macrophage system occurring in recurrent malaria may cause an excessive synthesis of gamma globulin.

R. Passmore

Close, J. Le taux des protéines sériques chez le nourrisson africain. [**The Value of Serum Proteins in the African Child**] *Ann. Soc. Belge de Méd. Trop.* 1955, Apr. 30, v. 35, No. 2, 129–44, 7 figs. [25 refs.]

This paper records values of total protein, albumin, alpha, beta and gamma globulin in sera from 141 children aged 0 to 24 months of the Bashi race in the Belgian Congo. Total protein rose from 5·35 at birth to 6·62 gm./100 ml. Albumin at birth was 3·66, fell to 3·44 at 3 months

and then rose to 3·75 gm./100 ml. Alpha and beta globulin were each 0·29 at birth and rose rapidly to 0·73 and 0·50 gm./100 ml. Gamma globulin was 1·1 at birth, fell to 0·44 at 3 months and then rose progressively to 1·64 gm./100 ml. There was no sign of a fall off in this rise at 2 years. Graphs depict mean values at each age and the standard deviation. These results are fully discussed. The stabilization of the albumin levels after the first 3 months is probably dependent on an alimentary factor. The rise in gamma globulin is difficult to interpret. It may be due to a liver dysfunction appearing in the first months of life and of nutritional deficiencies or perhaps it may be due to a racial physiological difference. [There is no discussion of malarial infections as a possible cause.] *R. Passmore*

Brock, J. F., Hansen, J. D. L., Howe, E. E., Pretorius, P. J., Davel, J. G. A. & Hendrickse, R. G. **Kwashiorkor and Protein Malnutrition. A Dietary Therapeutic Trial.** *Lancet.* 1955, Aug. 20, 355–60, 2 figs. [16 refs.]

This is an important paper, for it outlines a new method for the study of kwashiorkor. Standard conditions were laid down for the treatment of children, with kwashiorkor, admitted to 3 separate hospitals in South Africa. A cooperative research project was thus possible into factors which determine aetiology and initiate cure. All the children received a standard electrolyte solution for 24 hours and chemotherapy for at least a week. Feeds were made up by means of test formulae containing standard mixtures of salts and vitamins and other nutrients. It was shown that a formula containing only casein, glucose and the salt mixture was as effective as skim milk in initiating cure and restoring the albumin level. This formula was " vitamin-free ". This would appear to demonstrate conclusively that casein is the active therapeutic factor in skim milk and that the vitamins play, at most, a subsidiary rôle.

In an addendum a report is given of a few children who responded well when a mixture of amino-acids was substituted for the casein. With this technique it should be possible to work out which of the amino-acids plays the dominant part in therapy. Presumably lack of these amino-acids is the essential cause of the disease, and their identification should be a good guide to finding suitable foods useful in its prevention.

R. Passmore

de Silva, C. C. **Suprarenal Haemorrhages in Kwashiorkor.** (A Preliminary Report.) *J. Trop. Pediatrics.* London. 1955, Sept., v. 1, No. 2, 112–6.

Acute haemorrhages in the suprarenal glands were found at autopsy in 3 children who died of kwashiorkor in Colombo. The illnesses had been of short duration—1 week, 16 days and 4½ weeks. *R. Passmore*

Tovar-Escobar, G. & de Majo, B. L. **Multiple Deficiency Syndromes in Infants and Children (Venezuelan Kwashiorkor).** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, June, v. 7, No. 2, 116–29, 5 figs. [Numerous refs.]

This paper gives a good account of the clinical conditions and the dietary background of the disease and also has a useful review of the Latin American literature. Kwashiorkor is common in Venezuela and, as observed there, is very similar to, but not identical with, the disease as described in Africa. Retarded growth, mental apathy, oedema, fatty infiltration of the liver and various dermatoses are present, but skin depigmentation is rarely seen. Hair depigmentation was present in just under half of their patients. Milk was the most effective therapeutic agent and a shortage of milk is probably the main factor in the aetiology. Most of the patients harboured a variety of tropical parasites, but no more than a control series of children. It is concluded that tropical parasitism plays only a secondary rôle as an aggravating factor.

R. Passmore

HAEMATOLOGY

Gokhale, S. K. & Panse, M. V. **Blood Glutathione and its relation with Haemoglobin and Red Blood Cell Count in Normal Indians.** *Indian J. Med. Res.* 1955, July, v. 43, No. 3, 397–402, 3 graphs.

" 1. Bloods of one hundred and two normal healthy young Indian men for their haemoglobin, red blood cells, and glutathione, total, reduced, oxidized, have been examined. The average values obtained are:—

(a) Haemoglobin content ... 14·57 g. per 100 c.c. of blood.
(b) Red blood cell count ... 4·86 millions per c.mm.
(c) Glutathione total ... 41·25 mg. per 100 c.c.
(d) Glutathione reduced ... 36·50 mg. per 100 c.c.
(e) The difference between the total and reduced gave the value of oxidized glutathione which is 4·75 mg. per 100 c.c. of blood.

" 2. As the glutathione is a component of the red blood cells, factors were calculated as coefficients showing relation between

(i) $\frac{\text{Glutathione}}{\text{Red blood cells,}}$ and (ii) $\frac{\text{Glutathione} \times \text{Haemoglobin}}{\text{Red blood cells.}}$

The average values obtained for them are 7·67 and 110·30, respectively."

Chernoff, A. I. **The Human Hemoglobins in Health and Disease.** *New England J. of Med.* 1955, Aug. 25, Sept. 1 & 8, v. 253, Nos. 8, 9 & 10, 322–31; 365–74; 416–23, 17 figs. [279 refs.]

Cabannes, R., Sendra, L. & Dalaut. Nouvelle hémoglobine humaine héréditaire à migration plus rapide que l'hémoglobine normale. [**A New Hereditary Human Haemoglobin Electrophoretically more Rapid than Normal**] *C.R. Soc. Biol.* 1955, May, v. 149, Nos. 9/10, 914–16, 1 fig.

The following is a translation of the authors' summary:—

We have observed in Algeria a new hereditary haemoglobinosis marked by the presence of a haemoglobin fraction more rapid [in paper electrophoresis] than haemoglobin A. This anomaly was accompanied in heterozygotes by clinical and haematological signs of little importance. It is proposed to call this haemoglobin Hb.H. *H. J. O'D. Burke-Gaffney*

Itano, H. A. **Clinical States associated with Alterations of the Hemoglobin Molecule.** *Arch. Intern. Med.* 1955, Sept., v. 96, No. 3, 287–97, 6 figs. [63 refs.]

This is the text of the Minot lecture read to the American Medical Association in June 1955. It records the rôle played by Dr. William B. Castle, the first Minot lecturer, in stimulating Dr. Linus Pauling to postulate that an abnormal haemoglobin was present in sickle cells.

The paper surveys the differences in electrophoretic properties and solubilities of the known haemoglobin variants and has a short discussion of the various disease states. It emphasizes that the discovery and study of sickle-cell haemoglobin provided for the first time the explanation for the manifestations of a particular disease on the basis of the physical properties of an abnormal molecule. As the synthesis of this abnormal molecule is due to the presence of a human mutation a valuable experimental tool is at hand for the study of its inheritance as it is not necessary for the heterozygote to produce offspring in order to expose the abnormality. These considerations are particularly important if one realizes that enzymes are proteins and could be similarly affected as the haemoglobin molecule is in sickle-cell anaemia. It is likely that mutations which alter the structure of enzymes or inhibit their production may well be responsible for other diseases, both inherited and acquired.

H. Lehmann

Huisman, T. H. J., van der Schaaf, P. C. & van der Sar, A. **Investigations on the Abnormal Haemoglobin in Sicklaemia and Sicklecell Trait.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Sept., v. 7, No. 3, 285–91, 3 figs. [19 refs.]

This is an English version of the paper abstracted in this *Bulletin*, 1955, v. 52, 83.

Lehmann, H. **Distribution of the Sickle Cell Gene. A New Light on the Origin of the East Africans.** *Eugenics Rev.* 1954, July, v. 46, No. 2, 101–21, 19 figs. [35 refs.]

Until comparatively recently the sickling trait and sickle-cell anaemia were thought to be almost entirely confined to African peoples. The author paid a visit to India to see whether a search for the sickling gene might not throw some light on the origins of the East Africans. He found very high frequencies among the Veddoids of South India. These tribes did not share the very high frequency of the Rhesus gene R_0 (cDe), which is characteristic of Africans, so if the common possession of the sickling gene indicates a racial connexion, the route of invasion must have been from East to West. Dr. Lehmann then investigated the Achdam of South Arabia, a group of people with Veddoid features who do not intermarry with the Arabs. In them too a high incidence of sickling was found. They may represent a survival in the track of invasion.

It is held that 3 major factors play a part in producing a high incidence of the sickling gene: (1) the anthropological derivation of the population; (2) genetic regulation, such as protection against malaria; (3) social conditions which favour inbreeding. The whole paper is a lucid exposition of these and related problems. *J. A. Fraser Roberts*

Tosteson, D. C., Carlsen, E. & Dunham, E. T. **The Effects of Sickling on Ion Transport. I. Effect of Sickling on Potassium Transport.** *J. General Physiol.* 1955, Sept. 20, v. 39, No. 1, 31–53, 7 figs. [27 refs.]

Tosteson, D. C. **The Effects of Sickling on Ion Transport. II. The Effect of Sickling on Sodium and Cesium Transport.** *J. General Physiol.* 1955, Sept. 20, v. 39, No. 1, 55–67, 2 figs.

See also p. 148, Foy *et al.*, **Two Surveys to investigate the relation of Sickle-Cell Trait and Malaria.**

Song, Y. S. **Cirrhosis of the Liver in Sickle Cell Disease. Report of a Case with a Review of the Literature.** *Arch. Pathology.* 1955, Sept., v. 60, No. 3, 235–9, 6 figs. [27 refs.]

The subject of this report is a Negro boy who was known for 8 years to suffer from sickle-cell disease before he died at the age of 15. He was suffering from hepatic cirrhosis and on post-mortem examination a nodular liver was discovered, the nodules being of varying size, deep red and separated by broad bands of grey fibrillary tissue. On microscopic

examination the lobular patterns were found to be irregular or absent. Occasionally areas of rather fresh cellular necrosis were seen. Surrounding these necrotic areas the sinusoids were seen to be dilated and stuffed with sickle cells. The hepatic arteries were obliterated by an agglutinative material composed of numerous sickle cells. Around these the liver cells were markedly dissociated. There were scanty amounts of iron pigment noted in the liver cells, but the scar tissue was free from pigmentation.

There is a review of the American literature on liver damage in sickle-cell disease—relatively less attention having been paid to hepatic lesions in comparison with those changes in the spleen and bone-marrow about which detailed descriptions were made repeatedly, and which were also seen in the present instance.

[Sickle-cell disease is no longer a single entity, and it would have been important to know whether this boy—whose spleen was incidentally not small and fibrotic but enlarged with numerous discrete bulging nodules—had been suffering from the homozygous sickling condition, sickle-cell-haemoglobin-C disease or sickle-cell-Mediterranean disease.]

H. Lehmann

Lie-Injo Luan Eng. **Investigation on Foetal Haemoglobin in Indonesia.** *Documenta Med. Geograph. et Trop. Amsterdam.* 1955. Sept., v. 7, No. 3, 273–9, 1 fig. [13 refs.]

The author has examined adults and children for the presence of foetal haemoglobin; 152 normal adults (143 Indonesian and 9 Chinese) showed foetal haemoglobin varying from 0·3 to 1·6 per cent. of their total haemoglobin measured by the alkali denaturation technique of Singer *et al.* (*Blood*, 1951, v. 6, 413, 429); 109 blood samples from children were also tested and all were haematologically normal. Seventeen cord blood specimens contained 54 to 90 per cent. foetal haemoglobin. The alkali-resistant haemoglobin rapidly decreased during the first 6 months of life, and between 6 months and 2½ years only very occasionally could percentages above 1·6 be found. The highest of them was 3·8 per cent.

Two children with thalassaemia major had foetal haemoglobin percentages of 90 per cent. and 27 per cent., respectively. One with thalassaemia-haemoglobin-E disease also showed a markedly raised level on three different occasions (11 per cent., 20 per cent. and 28 per cent.). Some of these children's brothers and sisters, and in 2 cases also one of the parents had small amounts of foetal haemoglobin in their blood. Of 63 adults who were suffering from various diseases 61 showed no foetal haemoglobin, in one case a leukaemia patient showed 2 per cent. during acute exacerbation and one patient with anaemia associated with malaria had 2·3 per cent. during convalescence. No significant increase of foetal haemoglobin was found in the blood of 35 patients suffering from anaemia associated with malaria.

H. Lehmann

Brumpt, L. C. À propos de l'anémie de Cooley : thalassémie ou sinémie? [**On Cooley's Anaemia: Thalassaemia or Sinaemia?**] *Bull. Acad. Nat. Méd.* 1955, v. 139, Nos. 19/20, 333–5.

This abstract summarizes a lecture by a member of the Royal School of Medicine of Pnom-Penh (Cambodia). Pointing out the high frequency of thalassaemia in Asia including China he suggests that thalassaemia may be a Chinese trait and may have been carried by Attila and other Huns into Europe. The author doubts that thalassaemia major is a homozygous condition [but one wonders whether he realized at the time that haemoglobin-E-thalassaemia disease which is a heterozygous condition is nearly indistinguishable clinically from thalassaemia major].

H. Lehmann

Clement, D. H. & Taffel, M. **Splenectomy in Mediterranean Anemia.** *Pediatrics.* Springfield, Ill. 1955, Sept., v. 16, No. 3, 353–62, 4 figs. [18 refs.]

Mediterranean (erythroblastic) anaemia is an inherited defect in red cell formation and is regarded as an inborn error of pigment metabolism, in which the patient is unable to synthesize adequate amounts of haemoglobin. It is prevalent along the northern shore of the Mediterranean, whereas sickle-cell disease is found along the southern shore. It may occur in a minor form with a normal life span, or as a severe anaemia present from birth or early infancy and greatly shortening life—the major form. There is enlargement of liver and spleen and the blood is characterized by a hypochromic microcyctic type of anaemia, which is resistant to iron therapy, and normoblasts are present in greater numbers than the severity of the anaemia would suggest. The process is not a simple haemolytic one (though there are features of haemolytic anaemia) and there is no accumulation of iron-containing pigment in the endothelial cells lining the sinusoids of the spleen and the Kupffer cells of the liver. The pattern is more that of haemochromatosis. The red cells have a shortened survival time when transfused into normal people and it has been shown that the " circulating life span " of normal red blood cells transfused to these patients was markedly shortened [this *Bulletin*, 1954, v. 51, 426; 1955, v. 52, 1015]. As the spleen is the main site of destruction of normal and abnormal erythrocytes, its removal should benefit patients with Mediterranean anaemia who have large spleens and require frequent transfusions; in some cases as much as 500 ml. every two weeks was required, suggesting that the donor red cells had a shorter life than the expected 120 days, as blood loss could be excluded and haemoglobin levels did not mount.

Four cases in children aged from 2 to 12 years, who needed about one pint of blood every 2 or 3 weeks, and who were treated by splenectomy, are described. There was great improvement in general health and reduction to a half to one-third in the amount of blood needed for

transfusion. Although the spleens of such patients are very large, they are easily removed, as there is very little perisplenic inflammatory reaction. Meticulous haemostasis is particularly important in these small patients, as the loss of small amounts of blood may represent a critical reduction of the total blood volume.

The proper selection of patients for splenectomy is the crux of the problem. In patients without marked splenomegaly and large transfusion needs, splenectomy is not indicated. It is in the severe cases that its performance may reduce the transfusion need by 25 to 50 per cent. of the pre-operative level. In such cases a calculation of the blood volume from body weight and the known transfusion need will show that donor blood is surviving less than the expected 100 or more days, and in these patients removal of the spleen is indicated. Failure to benefit from splenectomy may be expected if the organ is removed early in the course of the disease before it has greatly enlarged and the transfusion need has become great. Operation will accomplish little in the terminal phase of the disease when the liver is huge. *W. L. Harnett*

Tasker, P. W. G. **Studies of the Nutritional Anaemias of Malaya: the Prevalence of Iron Deficiency.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Sept., v. 49, No. 5, 478–82, 3 figs. [21 refs.]

For a period of one year 314 patients were observed, more than half of whom were Southern Indians, one-third Chinese and only a few from other races in Malaya. All were from the lower income groups, mainly labourers. All patients suffered from anaemia and malnutrition but showed clinically no other diseases. When the serum iron level was plotted against the haemoglobin level it was found that up to 8 gm. per cent. haemoglobin the iron concentration was 50 μgm. per 100 ml. or even lower. After this it rose rapidly and at 15 gm. per cent. the serum iron level was about 150 μgm. per 100 ml. When the serum iron was plotted against the mean corpuscular haemoglobin concentration it was found to be about 50 μgm. up to 27 per cent. MCHC, then it rose rapidly and from 30 per cent. MCHC to 36 per cent. it was about the same, ranging between 100 and 150 μgm. The author states that the data recorded by him show the important rôle played by iron deficiency in the development of the nutritional anaemias encountered in his patients. He correlates his findings with facts brought out in physiological work on the haemodynamics of chronic anaemia. There is a critical point when the haemoglobin is about 6–7 gm. per cent. and there is a sudden rise in right auricular pressure and in the percentage availability of oxygen. This is very near the concentration at which the author found the serum iron concentration to level off when he plotted its values against the haemoglobin levels found in his patients. *H. Lehmann*

VENOMS AND ANTIVENENES

Neumann, W. P. & Habermann, E. Über Crotactin, das Haupttoxin des Giftes der brasilianischen Klapperschlange (*Crotalus terrificus terrificus*). [**Crotactin, the Principal Toxin of the Venom of the Brazilian Rattlesnake** (*Crotalus terrificus terrificus*)] *Biochem. Ztschr.* 1955, v. 327, No. 3, 170–85, 4 figs. [27 refs.]

Grasset, E. & Schwartz, D. E. Effets inhibiteurs de l'héparine et du sulfate de dextrane, seuls ou combinés avec l'ACTH et la cortisone, sur l'action des venins coagulants hémorragipares des vipéridés. [**Inhibitory Effect of Heparin and Dextran Sulphate, alone or with Cortisone and Corticotrophin, on the Blood-Coagulating Actions of Viper Venoms**] *Bull. Schweiz. Acad. Med. Wiss.* 1955, May, v. 11, Nos. 1/2, 10–22.

The English summary appended to the paper is as follows:—

"The investigations of the authors bring new precisions on the inhibiting anticoagulant action exerted in vitro and in vivo by heparin as well as by dextran sulphate (a semi-synthetic anticoagulant), on the coagulant powers of certain viperine venoms, such as Vipera russellii and Vipera aspis. A similar anticoagulant action is exerted by these two anticoagulants on the coagulant fraction isolated by electrophoresis from Vipera russellii venom.

"The protective powers conferred by heparin or dextran sulphate against Vipera russellii and Vipera aspis are enhanced by a combined treatment with cortisone and ACTH, resulting in the survival of the rabbits so treated, to the intravenous injection of several lethal doses of those venoms, killing the untreated rabbits within a few minutes."

Ojha, K. N. **Protective Effect of B.A.L. in Experimental Viper Venom Poisoning in Guinea Pigs.** Preliminary Report. *Indian J. Med. Sci.* 1955, Sept., v. 9, No. 9, 534–6.

"1. Russell's viper venom causes acute mortality in guinea pigs. The percentage rate of mortality varies according to the dose of viper venom used. There is 100 per cent mortality with dosages of 0·3 mg./100 G. and 1 mg./100 G. The mortality rate fell down with smaller dosages of viper venom.

"2. Dimercaptol, B.A.L., when administered prior to the viper venom reduced significantly the rate of mortality and gave complete protection when smaller dosages of viper venom were used.

"3. It is considered that the protection afforded by B.A.L. may be by virtue of –SH groups".

Bettini, S. & Cantore, G. Sull'azione protettiva dell'ACTH, del cortisone, del gluconato di calcio, della pirilamina (Neoantergan), della prometazina (Fargan), della cloropromazina (Largactil) nel latrodectismo indotto nella cavia. [**Protective Action of Corticotrophin, Cortisone, Calcium Gluconate, Pyrilamine (Neoantergan), Promethazine (Fargan), and Chlorpromazine (Largactil) in Induced Guinea-pig Latrodectismus**] *Rendiconti Istituto Superiore di Sanità.* Rome. 1955, v. 18, Pt. 6, 488–95. [16 refs.] English summary (7 lines).

[See this *Bulletin*, 1955, v. 52, 684.]

Tange, Y. Beitrage zur Kenntnis der Morphologie des Giftapparates bei den japanischen Fischen XI. Über den Giftapparat bei *Siganus fuscescens* (*Houttuyn*). [**Studies on Morphology of Poison Apparatus in Japanese Fish. XI. Poison Apparatus of** *Siganus fuscescens*] *Yokohama Med. Bull.* 1955, Apr., v. 6, No. 2, 115–22, 4 figs.

TOXOPLASMOSIS

Soler Durall, C. & Vilardell Viñas, F. Encuesta sanitaria sobre sensibilidad a la toxoplasmina en la población de Barcelona. [**Epidemiological Survey of Toxoplasmin Sensitivity in the Population of Barcelona**] *Med. Colonial.* Madrid. 1955, Sept. 1, v. 26, No. 3, 197–211, 7 figs. [20 refs.]

The English summary appended to the paper is as follows:—

"The authors make an epidemiological survey among the population of Barcelona on the Toxoplasmin test on 1,053 nonselected people 27·63 per cent of whom reacted positively, getting the maximum of positivities with 53·6%, between 30 and 40 years of age.

"They submitted their conclusions to a comparison with other authors emphasizing the epidemiological interest of this kind of survey, being the first realised in Spain up to date."

Céspedes, R. & Morera, P. Toxoplasmosis. Estudio clínico patológico de los dos primeros casos reportados en Costa Rica. [**Clinical and Pathological Study of the First Two Cases of Toxoplasmosis reported in Costa Rica**] *Rev. Biologia Trop.* San José, Costa Rica. 1955, July, v. 3, No. 1, 1–29, 24 figs. (7 coloured) on 5 pls. [15 refs.] English summary.

These two cases occurred in children aged 18 months and 6 years, respectively, in the same rural area on the Pacific Coast of Costa Rica.

Neither was diagnosed during life, and the clinical condition was obscured in the first case by the presence of a picture suggesting jungle yellow fever and in the second by a severe hookworm anaemia. Pseudocysts or isolated forms of *Toxoplasma* were found at autopsy in the myocardium, brain and spleen and, in the second case, the organism was cultivated from mice inoculated with myocardium and spleen removed post mortem. No ocular lesions were found.

The region is one having a warm, humid climate and defective hygienic conditions. The origin of the infection could not be determined.

The paper is illustrated with 24 photomicrographs, 7 of them in colour.

H. J. O'D. Burke-Gaffney

Ariztía, A., Martínez, F., Howard, J., Latorre, M. & Náquira, F. Toxoplasmosis connatal activa en un recién nacido con demostración del parásito durante la vida del paciente. (Primer caso en Chile.) [**Active Neonatal Toxoplasmosis in a Newborn with Demonstration of the Parasite during the Patient's Life.** (First Case in Chile.)] *Bol. Chileno de Parasit.* 1955, Apr.–June, v. 10, No. 2, 33–6. English summary.

Grönroos, P. **The Action of Properdin on** *Toxoplasma gondii.* **A Preliminary Report.** *Ann. Med. Exper. et Biol. Fenniae.* Helsinki. 1955, v. 33, No. 3, 310–15.

Properdin is a naturally occurring serum factor which has a lytic effect on toxoplasms. The factor is not usually found in children but may be present in adult sera to a titre of 1 in 64. The mechanism of the Sabin and Feldman dye test for toxoplasmosis is investigated and it is tentatively concluded that the activator serum necessary must contain properdin and the complement factors C2, C3 and C4. Clearly this "toxoplasm-hostile" serum component properdin may give rise to erroneous dye test results. It is necessary to inactivate properdin by heating at 56°C. for 30 minutes before submitting any serum to the dye test.

I. A. B. Cathie

Wysocka, Felicja & Umiński, J. Z badań nad swoistością odczynu wiązania dopełniacza z antygenem toksoplazmowym. *Toxoplasma* a *Sarcosporidia.* [**Studies on the Specificity of the Complement-Fixation Reaction with** *Toxoplasma* **Antigens.** *Toxoplasma* **and** *Sarcosporidia*] *Med. Dośw. i Mikrob.* Warsaw. 1955, v. 7, No. 4, 393–7. [13 refs.]

The English summary appended to the paper is as follows:—

"Complement fixation tests with toxoplasma antigen were made using 573 sera (from pigs as well as from cows and sheep). The animals were

investigated as to symptoms of Sarcosporidia infection. Complement fixation tests involving 18 Sarcosporidia infected pigs were all negative. The tests were positive with sera of three cows out of 36 showing signs of Sarcosporidia infection and negative with those of seven sheep. Sarcosporidiosis does not present any obstacles to the interpretation of the results of complement fixation tests with toxoplasma antigen."

KRAUSE, A. C. *Toxoplasma* **in Tissues of Man and Pets.** *J. Parasitology.* 1955, Oct., v. 41, No. 5, 545–8. [10 refs.]

" Suspension of the brain, liver and occasionally lung and spleen of 23 dogs and ten cats that were house and farm pets were inoculated into white mice. One strain of *Toxoplasma gondii* was obtained from one adult dog. The tissue from the liver, heart and spleen from the post-mortem examination of 30 patients and the brain tissue from ten patients gave no evidence for infection when they were treated in a similar manner.

" Random sampling of tissue for *Toxoplasma gondii* from dogs, cats and man by passage of the parasite through mice reveals slight or no evidence of chronic infection. The method may be applied better to smaller animals of which the whole organs can be used."

DERMATOLOGY AND FUNGUS DISEASES

LUBARSKY, R. & PLUNKETT, O. A. *In vitro* **Production of the Spherule Phase of** *Coccidioides immitis.* *J. Bacteriology.* 1955, Aug., v. 70, No. 2, 182–6, 7 figs. [12 refs.]

The development of the parasitic or spherule form of *Coccidioides immitis* in artificial culture was first reported by MACNEAL and TAYLOR (*J. Med. Research*, 1914, v. 30, 261), and since then by a number of other observers, chiefly in connexion with the growth of the spherule form in culture on the developing chick embryo [see this *Bulletin*, 1951, v. 48, 755; 1952, v. 49, 798, 995; 1953, v. 50, 244, 339].

In the present study, a culture fluid of the type employed for tissue culture was used. This consisted of sterile Tyrode solution, 4 parts; serum of young cockerels, 2 parts; chick embryo extract—prepared by grinding 9-day-old embryos in 0·2 ml. of Tyrode solution per embryo—2 parts. The mixture was filtered through a Seitz filter. Essential factors for the development of the spherule phase in this medium were, an incubation temperature of 37°C., reduced oxygen tension and renewal of the medium after 48 hours' growth.

The apparatus used was a hard glass test tube 22 by 160 mm. with

an L-shaped limb of 8 mm. glass tubing let into the bottom of the larger tube, to serve as a means of withdrawing samples of the culture and replenishing the culture fluid. This little tube was closed by a rubber serum cap and the larger tube by a perforated rubber bung through which two glass tubes passed, one reaching to the bottom of the culture tube and the other to about 1 inch below the bung. These tubes were used for passing a mixture of carbon dioxide (88 per cent.) and oxygen (12 per cent.) through the medium.

The culture tube, containing 8 ml. of the culture fluid, was placed in the incubator at 37°C. After one hour, 0·5 litre of the gas mixture was bubbled through the medium which was then inoculated with a suspension of spores and mycelial fragments of a culture of *C. immitis* in 0·75 ml. of Tyrode solution. At intervals of 6, 18, 24, 48, 60, 72, 84 and 96 hours from the commencement of the experiment, 0·75 litre of the gas mixture was bubbled through the medium during a period of 1 hour. Samples of 0·25 ml. of the culture were withdrawn just before the passage of the gas at the 18-, 24- and 48-hour intervals and 2·25 ml. at the 72-hour interval. After this, 3·0 ml. of fresh culture fluid was added, and further samples were taken up to the end of 108 hours. Examination of the samples showed progressive rounding-up of the spores to form immature spherules, but the 72-hour sample showed some germination of the spherules with a tendency to revert to the mycelial phase; this was due to staling of the medium, and could be averted by replenishing the fluid at 48 hours instead of 72 hours. The later samples showed the production of typical sporangia which ruptured and discharged their endospores. The characteristic segmentation of the cytoplasm with formation of the endospores could be followed in the specimens.

Poorer production of spherules occurred when horse or human serum was substituted for the rooster serum, and when the oxygen tension in the gas mixture was increased.

The technique should prove valuable for the production of quantities of the spherule form for serological studies and for fungicidal and fungistatic tests *in vitro*.

J. T. Duncan

Fiese, M. J., Cheu, S. & Sorensen, R. H. **Mycelial Forms of *Coccidioides immitis* in Sputum and Tissues of the Human Host.** *Ann. Intern. Med.* 1955, Aug., v. 43, No. 2, 255–70, 8 figs. [29 refs.]

Recent histopathological studies of the residual pulmonary lesions of coccidioidomycosis, with the use of the Hotchkiss-McManus staining technique (PAS, periodic-acid-Schiff), have shown that the mycelial or saprophytic form of *Coccidioides immitis* is not uncommon in persistent cavities and in the necrotic material in chronic granulomata. Puckett [this *Bulletin*, 1954, v. 51, 1293] found the hyphal form of *C. immitis* in 73 per cent. of 34 cases with coccidioidal pulmonary cavity and in 30 per

cent. of 30 cases with pulmonary granulomata, in a study of material obtained by surgical excision. Hitherto, however, no report has been made of the occurrence of the mycelial form of the fungus in sputum.

The present report, on a study at the Fresno Veterans Administration Hospital, California, deals with the examination of both the sputum and lung lesions for the presence of the mycelial form and the parasitic spherule form of *C. immitis*. Of 9 patients with persistent pulmonary cavity, 8 had *C. immitis* in the sputum; in the spherule form in 4 and in the mycelial form in 4. Eight of the patients were subjected to surgical pulmonary resection, and the histopathological examination of the cavity showed *C. immitis* present in 7, the spherule form in 7 instances and the mycelial form in 3. Seven other patients had granulomatous pulmonary lesions without cavity, and in none of these was the fungus found in the sputum. Pulmonary resection was performed on 4 of these 7 patients, and in all 4, *C. immitis* was found in the lesion; the spherule form was found in 3 and the hyphal form in 3. It will be seen, therefore, that *C. immitis* was present in its hyphal form in the residual, pulmonary coccidioidal lesions of 6 out of 16 patients, in 3 instances in a cavity and in 3 in a solid lesion. Brief accounts are given of 7 of the patients on whom pulmonary excision was performed.

The parasitic spherule form of *C. immitis* is found in the living tissue of the lesion and also in necrotic or caseous material, but the mycelial form has been found only in necrotic or dead tissue in which it seems to grow saprophytically, the mycelium being often atypical and sometimes merely abortive. In sections stained by haematoxylin and eosin, the mycelial structure is difficult and sometimes impossible to find, but after staining by the PAS method it is easily detected. In the present studies, old haematoxylin-stained sections which had been pronounced negative for the hyphal form, were found positive when re-stained by PAS. It will be evident, therefore, that, in the past, failure to notice this form of the fungus in the tissues was attributable to the lack of a suitable, selective fungal stain.

For immediate microscopical examination, it is recommended that the cavity in the freshly resected lung tissue should be opened, its lining scraped, and the material obtained mounted for examination in fountain-pen ink which provides a very good stain for the fungus. Tissue sections may also be stained by this ink (Parker 51 Super Chrome Blue Black Ink), or by PAS.

The presence of the mycelial form—the infective form—of the fungus in the sputum of coccidioidomycosis patients, again raises the question of the contagiousness of the disease. To this, the authors answer "whatever the theoretical hazard of communicability of coccidioidomycosis, the practical hazard is so insignificant that, except for ordinary precautions, it can safely be disregarded. . . . Clinical evidence is overwhelmingly convincing that coccidioidomycosis is not ordinarily a contagious disease". *J. T. Duncan*

Snapper, I., Baker, L. A., Edidin, B. D. & Kushner, D. S. **The Results of 2-Hydroxystilbamidine Therapy in Disseminated Coccidioidomycosis.** *Ann. Intern. Med.* 1955, Aug., v. 43, No. 2, 271–86, 2 figs. [27 refs.]

The therapeutic value of stilbamidine in North American blastomycosis is now clearly established, but the toxic effect of this drug, manifested by delayed development of trigeminal neuropathy is a deterrent to the use of high dosage. 2-Hydroxystilbamidine, which is relatively non-toxic and can be given in higher dosage, has also proved effective in some cases of North American blastomycosis. Tests *in vitro* have shown that the fungistatic effect of stilbamidine and of 2-hydroxystilbamidine against *Coccidioides immitis* in culture is equal to that shown against the more resistant strains of *Blastomyces dermatitidis*, and a solitary report on the therapeutic use of stilbamidine in coccidioidomycosis showed the result to have been, at least, encouraging.

The present paper deals with the results of treatment of 7 cases of disseminated coccidioidomycosis with 2-hydroxystilbamidine.

The first patient, a 28-year-old U.S. Air Force sergeant, was discovered, at a routine chest X-ray examination, to have a small nodule in the upper lobe of the right lung. A wedge resection was performed and the coccidioidal nature of the lesion revealed. The post-operative course was unfavourable, and a right-side, loculated, coccidioidal empyema developed, necessitated eventual pulmonary decortication and the excision of discharging sinus tracts. A month later, signs of intracranial disease appeared and the diagnosis of coccidioidal meningitis was established. At this stage, treatment with 2-hydroxystilbamidine was commenced, the dosage being 250 mgm. daily by slow intravenous administration. At the end of the first month of treatment, the state of the cerebrospinal fluid showed definite signs of improvement, but after every injection the patient complained of nausea and vomiting. When a total of 18 gm. had been given, the fungus could no longer be cultivated from the cerebrospinal fluid and there was a considerable general clinical improvement with abatement of the signs of meningitis; draining sinuses in the chest wall had closed and the radiological picture of the lung showed some clearing, but a low-grade fever persisted. The course of treatment was completed by an additional 5 gm. of the drug, and after this the patient's condition became so good that he was able to resume his work, which entailed driving a heavy truck 100 miles in a day. Nevertheless, the infection was not cured and there were clinical and serological signs indicating a low grade of activity. This was the most impressive case of the series. Of the remaining 6 patients, all of whom suffered from disseminated coccidioidomycosis, 2 died but the other 4 showed evident improvement with arrest of the progress of the disease, but total cure was not achieved in any case.

The total dosage given in the 6 adult cases ranged from 16 to 23 gm.,

and in a 9-year-old child 7·7 gm. This dosage was equivalent to a total of 0·30 to 0·4 gm. per kilogramme of body weight, and it caused no sign of toxicity or interference with the renal or hepatic function. An immediate reaction during intravenous injection was an indication to decrease the concentration of the drug per unit time of injection. Nausea and vomiting might be distressing and call for interruption of the treatment.

For the time being, it may be said that although 2-dihydroxystilbamidine appears to have no curative effect on disseminated coccidioidomycosis, it is not without value. Further therapeutic tests on a greater number of patients, with long follow-up observation periods, are necessary for a fair evaluation. *J. T. Duncan*

del Negro, G., Lacaz, C. da S. & Bolognani, H., Jr. Ação "in vitro" da aureomicina, terramicina e cloranfenicol sôbre o *Paracoccidioides brasiliensis*. [**The Effect** *in vitro* **of Aureomycin, Oxytetracycline and Chloramphenicol on** *Paracoccidioides brasiliensis*] Reprinted from *Rev. Hosp. Clin.* 1955, May–June, v. 10, No. 3, 174–8. [12 refs.]

The English summary appended to the paper is as follows:—

"The 'in vitro' effects of chloramphenicol, aureomycin and terramycin on *Paracoccidioides* (*Blastomyces*) *brasiliensis* were studied. The authors have used 'in vitro' concentrations very close to usual blood concentrations of those antibiotics. No fungistatic effects were observed."

Tôrres, E. T. Blastomicose. [**Blastomycosis**] *Bol. Centro de Estudos Hosp. Servidores Estado.* Rio de Janeiro. 1954, Oct., v. 6, No. 10, 321–5, 2 figs.

The English summary appended to the paper is as follows:—

"The author reports the pathological findings of 15 surgical cases of Brazilian blastomycosis (Lutz disease) after a review of its diagnosis and treatment."

de Sanson, R. D. Traitement de la blastomycose (mycose de Lutz) localisée sur les cordes vocales. [**Treatment of Blastomycosis (Lutz's Mycosis) localized on the Vocal Cords**] *Bull. Acad. Nat. Méd.* 1955, v. 139, Nos. 3/4, 56–62.

Involvement of the pharynx and adjacent mucosal areas in Lutz's disease (South American blastomycosis) usually occurs by extension from lesions in the mouth parts. Localization of the disease in the larynx is rare, and the author describes the only case of this kind in his

long experience of the disease as an oto-rhino-laryngologist. A point of special interest in this case was its successful treatment by electrocoagulation of the lesion, which, before the introduction of sulphonamide therapy, was the method of choice in the treatment of strictly localized types of the disease in sites not richly supplied with lymphatic vessels.

The patient, a man aged 51, was seen in 1929 for a lesion on the left anterior pillar of the fauces which, on the diagnosis of Lutz's disease, was successfully treated by extensive electrocoagulation. Three years later he was found to have a granulomatous lesion of the vocal cords, which had been diagnosed in Europe as tuberculous, but on his return to Rio de Janeiro it was found to be Lutz's disease. It was decided to treat this lesion by electrocoagulation and, despite expert advice to the contrary, the approach to the vocal cords was made by the external route; by laryngotomy. After a high tracheotomy, performed as a safeguard, the thyroid cartilage was divided and the vocal cords exposed. The anterior one-third of each cord was covered with a vegetating, granulomatous lesion stippled with little yellow points representing miliary abscesses, each of which was carefully treated with the very fine point of the cautery. This difficult operation was entirely successful and healing of the wound, with reunion of the thyroid cartilage, was rapid. The patient was soon able to resume his professional work as an advocate and engage in normal social activities. In this connexion the author draws attention to the rarity of Lutz's disease in the higher social classes.

Observations made over the following 8 years showed no recurrence of the lesion, and the patient eventually died of some other disease.

J. T. Duncan

Mead, K. W. **Chromoblastomycosis at the Age of Eleven Years.** *Med. J. Australia.* 1955, July 30, v. 2, No. 5, 165, 2 figs.

TROPICAL OPHTHALMOLOGY

Bietti, G. B., Guerra, P. & Ferraris de Gaspare, P. F. La distrofia corneale nodulare a bandelletta dei paesi tropicali a suolo arido. (Contributo clinico ed anatomopatologico.) [**Band Form of Nodular Dystrophy of the Cornea as seen in Tropical Countries with an Arid Soil. A Clinical and Anatomo-Pathological Study**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1955, June, v. 36, No. 6, 291–316, 12 figs. (1 coloured on pl.). English summary.

This is a report on a condition of the cornea which the authors have seen in Eritrea, Somaliland and Saudi Arabia and which they have studied in some 69 cases, mostly men. The lesion appears as a horizontal

strip situated across the lower half of the cornea and made up of greyish raised points which develop under the corneal epithelium and correspond more or less to the palpebral opening, *i.e.*, to that part of the corneal surface which is most continually exposed to the elements. A histological examination was carried out in 16 of these cases and showed hyaline degeneration of the more superficial layers of the cornea.

The authors review a number of theories which have been suggested by other workers to explain the mechanism of this condition; they themselves believe that the aetiology is to be sought in a combination of factors which include intense evaporation from the surface of the cornea, the action of sand and wind and possibly also the effects of one or more chemical agents, such as salt spray. *J. Cauchi*

Banerjea, R. **An Epidemic of Koch Weeks Conjunctivitis.** *Indian Med. Gaz.* 1954, Oct., v. 89, No. 10, 573–5.

This study shows how an epidemic of conjunctivitis due to the Koch-Weeks bacillus persisted for two years among the inmates of an orphanage living under insanitary and overcrowded conditions, and how eventually the epidemic was brought under control by simple hygienic procedures combined with local treatment with Cibazol [sulphathiazole] eye ointment. *E. W. O'G. Kirwan*

HEAT STROKE AND ALLIED CONDITIONS

Boura, M. & Lemaire, R. L'adaptation aux climats tropicaux du sujet transplanté. [**Adaptation to Tropical Climates**] *Bull. et Mém. École Préparatoire Méd. Pharm. de Dakar.* 1954, v. 2, 180–97, 6 figs. [72 refs.]

The authors discuss the definition of tropical climates and recognize the following types:— (i) *equatorial*—a climate in which temperature and humidity remain almost constant, affected only temporarily by storms of electrical origin; (ii) *tropical*—less humid but with higher temperatures than in " equatorial " zones, with marked seasonal variations; (iii) *desert*—a dry climate with daily temperature variations of considerable degree.

Three stages in relation to acclimatization may be recognized:— (i) the phase during which physiological changes of adaptation are occurring; (ii) a balanced state in which the individual is acclimatized and able to enjoy an active life in the tropics; (iii) a stage in which, as the result of long residence, stress or intercurrent illness, a breakdown in the state of acclimatization occurs.

During the first stage the individual is liable to suffer from insomnia and palpitations and show a rise in systolic blood pressure. These changes are attributable to an increase of activity of the sympathetic nervous system. It is considered that there is also an increase in function of the suprarenal cortex and of the thyroid gland. In the second stage a new balance is reached in relation to the changed external environment. Increased perspiration, from peripheral vascular dilatation, aids the regulation of the body temperature and the content of the sweat and urine is modified. Evidence as to changes in the basal metabolic rate is contradictory. The third stage of loss of acclimatization, or tropical fatigue, is characterized by irritability and lack of concentration. The treatment is a return to a non-tropical climate. It is important to distinguish true adaptation from adaptation through life being made pleasant in the tropics by modifications of the environment by artificial means. *Frederick J. Wright*

MISCELLANEOUS DISEASES

Limbos, P. & Courtois, G. Un nouveau cas d'Onyalai observé à Stanleyville. [**A New Case of Onyalai seen at Stanleyville**] *Ann. Soc. Belge de Méd. Trop.* 1955, Apr. 30, v. 35, No. 2, 187–91, 1 fig. on pl.

The authors [this *Bulletin*, 1953, v. 50, (344)] have suggested that ascorbic acid deficiency is a predisposing factor in the development of onyalai. They have encountered another case of the condition, the details of which are set out at some length. The patient, an African aged 30, developed sanguinary bullous lesions in the mouth, tongue and lower lip overnight, but no other manifestations attributable to the condition. The lesions lasted only a few days. His blood showed a fall in platelets and there was a prolonged bleeding time. Treatment with ascorbic acid, given intravenously, in doses of 2 gm. daily on 4 occasions, was associated with a progressive rise in the blood ascorbic acid level, a restoration of the prothrombin time from under 5 per cent. to 100 per cent., and a return of the bleeding time to normal. Whether the ascorbic acid treatment in fact influenced the progress of the condition is not clear, as it was only a very mild case of onyalai initially. *A. R. D. Adams*

PARASITOLOGY: GENERAL

Lobo, M. B., Moreiras, M., Manceau, J. N. & Moraes, N. L. de A. Planejamento e execução de um inquérito coprológico. [**Coprologic Investigation: Planning and Execution**] *Hospital.* Rio de Janeiro. 1954, May, v. 45, No. 5, 575–88.

In this paper a statistical method is applied for arriving at the exact incidence of infections with intestinal parasites, on the basis of chosen samples. For details, the original should be consulted.

Coutelier, L. Quelques données sur l'invagination intestinale chez l'adulte et le grand enfant en Afrique centrale. [**Observations on Intussusception in Adults and Children in Central Africa**] *Ann. Soc. Belge de Méd. Trop.* 1955, June 30, v. 35, No. 3, 279–91. [16 refs.]

The English summary appended to the paper is as follows:—

"Presentation of 64 cases of intestinal intussusception in adults and children in a region neighbouring Lake Kivu with a mortality of 10%. Study of the local clinical aspect, varieties, prognosis and treatment.

"These intussusceptions are due for the most part to a primary invagination of a cecal haustra [recess made by one of the sacculations of the colon]. An etiological hypothesis is considered, involving several factors necessarily allied:

—ulceration of the cecal mucosa resulting from parasitosis;

—characteristic anatomical arrangement, congenital or acquired;

—influence of a nutritional factor."

Bailey, V. M. **Notes of the Incidence of Human Parasites in Samawa, Iraq.** *Bull. Endem. Dis.* Baghdad. 1955, July, v. 1, No. 3, 250–2.

Samawa (pop. 15,000) lies on the alluvial plain in the southern part of the *liwa* of Diwaniyeh, near the Euphrates. For half the year the climate is hot and dry.

For 8 months in 1953 the author examined stools and urines, and performed Kahn tests on specimens taken from women and infants in the local Maternity and Child Health Centre. The results are shown in a table and in the text. In 497 stools, *Ascaris* was found in 26·8 per cent., *E. histolytica* in 16·2 and hookworms in 9·5. Schistosome ova were found in 6·4 per cent. of 1,511 urines examined and all occurred in adults. Of 977 Kahn tests, 5·4 per cent. were positive.

In 1951 the Ministries of Social Affairs and Health of Iraq reported the incidence of some of these infections in Government Health Institutions in the Diwaniyeh *liwa*. It was found that *Ascaris* occurred in 2 per cent. and hookworms in 41 per cent. This higher incidence of hookworm

disease in the Health Institutions in the *liwa* is probably explained by the fact that the cases were selected and that Samawa is a relatively dry sector of the *liwa*. In the same year, 24·5 per cent. of positive Kahn tests were reported in Basrah, and this higher incidence may also be explained by selection. *H. J. O'D. Burke-Gaffney*

Melvin, Dorothy M. & Brooke, M. M. **Triton X-100 in Giemsa Staining of Blood Parasites.** *Stain Technology.* 1955, Nov., v. 30, No. 6, 269–75.

"The effects of a surface active agent, Triton X-100, were studied in the routine Giemsa staining of seven blood parasites: *Plasmodium vivax*, *Trypanosoma cruzi*, *T. lewisi*, *Leishmania donovani*, *Toxoplasma gondii*, and microfilariae of *Dirofilaria immitis* and of *Wuchereria bancrofti*. Concentrations of Triton X-100 ranging from 0·01% to 0·5% were used in staining (a) both thick and thin blood films of all organisms except *L. donovani*, (b) tissue smears of *L. donovani*, and (c) tissue and peritoneal fluid smears of *T. gondii*. In general, the addition of the detergent to the Giemsa solution resulted in cleaner preparations and better stained organisms. Morphological details were more distinct, thus facilitating microscopical detection and identification of species. The most beneficial concentration of Triton X-100 was found to be 0·1%. Since it has a hemolytic effect on erythrocytes, concentrations above 0·01% cannot be used in staining thin blood films. It is suggested also that the use of Triton—Giemsa may help prevent transfer of some of these organisms from one slide to another during mass staining procedures as it has been demonstrated to do with malaria parasites (Brooke and Donaldson, 1950)."

[See this *Bulletin*, 1950, v. 47, 518.]

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Cohic, F. & Rageau, J. Deux nouveaux milieux de montage à base de rhodoïd. [**Two New Mounting Media with a Basis of Rhodoid**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 2, 207–10.

Rhodoid, a cellulose bi-acetate transparent plastic, is readily available, at least in France, as a commercial product. It is made up as a mountant for mosquito larvae, fleas, lice, nematodes, etc., by dissolving

to 10 per cent. strength (or higher) in either Berlese's fluid or a chloral-lactophenol mixture. Specimens are allowed to clear first in one or other of these clearing reagents and then mounted on a slide beneath a cover-slip in the corresponding mountant containing Rhodoid. The preparation dries and hardens in about a day, but it is advisable to keep slides horizontal for a few days. Pure acetic acid or 50 per cent. acetic acid in distilled water has been successful also as a solvent and clearing agent. A specimen can be unmounted by standing in water or any of the 3 clearing mixtures for several hours. Chloral-lactophenol-Rhodoid preparations have preserved well for several years. With Berlese's fluid as the basis, 5 months is the limit of the authors' experience so far.

D. S. Bertram

Burton, G. J. **A Revised Procedure for making Rapid Permanent Mounts of Mosquito Larvae.** *Mosquito News.* 1955, Sept., v. 15, No. 3, 147.

Gahan, J. B., Labrecque, G. C. & Bowen, C. V. **An Applicator for adding Chemicals to flowing Water at Uniform Rates.** *Mosquito News.* 1955, Sept., v. 15, No. 3, 143–7, 2 figs.

Levinson, Z. H. **Nutritional Requirements of Insects.** *Riv. di Parassit.* Rome. 1955, Apr. & July, v. 16, Nos. 2 & 3, 113–38; 183–204, 3 figs. [Numerous refs.]

See also this *Bulletin*, 1955, v. 52, 1252, Horsfall, **Mosquitoes. Their Bionomics and Relation to Disease.**

Knierim, J. A., Lea, A. O., Dimond, J. B. & DeLong, D. M. **Feeding Adult Mosquitoes on Preserved Blood to Maintain Egg Production.** *Mosquito News.* 1955, Sept., v. 15, No. 3, 176–9, 1 fig. [10 refs.]

Mention has frequently been made in literature of the feeding of mosquitoes by means of pads soaked with blood and honey, but the application of this method to large-scale cultures is not widely employed.

Preliminary studies were made on *Aëdes aegypti*, with a cotton pad soaked in citrated beef blood, with the addition of 10 per cent. honey. " Several experiments " indicated better results if the pad were suspended from the roof, rather than placed on the floor, of the cage; no explanation of this is advanced. Oviposition occurred without honey in the feeding medium provided the pads were initially heated to 42°–45°C. before being put into the cage. Comparative dissections after feeding showed that an ingested blood-honey meal was conveyed mainly to the ventral diverticulum of the gut; in contrast, a pure blood meal passed directly to the midgut, apart from traces in the ventral diverticulum, as occurs

after normal feeding by "biting" or experimental feeding through membranes. The use of stored citrated blood, in which haemolysis had occurred owing to freezing, necessitated the addition of honey for egg production, whether the pads were heated or not.

In studies of *Anopheles quadrimaculatus*, the heat factor was found to be essential, and the thermotropic response of the adults was incorporated into the feeding device. Blood-soaked cotton was wrapped around a test tube containing warm water at human body surface temperature (34°–35°C.), when feeding was successful without honey. A modification of this method was made, with the use of a Pyrex tube, fitted with a "collar", which was inserted into the cage from above; a circulation of warm water from a reservoir or tap was maintained in the tube, or alternatively a thermostatically controlled heating unit set at 35°–38°C. was fitted. Experiments in feeding anophelines on a variety of protein fluids other than blood, preferably with the addition of 10 per cent. honey, were successful, and the method is therefore applicable to study of the food requirements of adult mosquitoes. *N. R. Phillips*

Grjebine, A. Observations sur les nématocères vulnérants de Madagascar: régions de Majunga et de la Mandraka. [**Notes on Biting Insects (Nematocera) in the Majunga and Mandraka Areas of Madagascar**] *Mém. Inst. Sci. Madagascar.* Ser. E. 1953, v. 4, 443–502, 31 figs. [20 refs.]

This report on biting insects collected in Madagascar includes descriptions and figures of the following species and varieties of mosquito new to science: *Uranotaenia douceti*, *U. kraussi*, *U. chorleyi* var. *hamoni*, *Orthopodomyia geberti*, *Aëdes tiptoni*, *Aëdomyia pauliani*, *Anopheles pauliani*, *A. roubaudi*, *A. lacani*, *A. ranci*, *A. milloti* and *A. fuscicolor* var. *soalalaensis*. Other insects taken were *Phlebotomus squamipleuris*, *Chrysops* sp., *Simulium* sp. besides ceratopogonids yet to be reported in detail. In all, 34 species of mosquito were found and these include 9 recorded for the first time from Madagascar. Descriptions are given of the areas where the work was done, as well as monthly records of temperatures and rainfall. Rain is negligible from May to September when temperatures range from 19·5° to 26°C.; in the rainy season, which is for most of the rest of the year, temperature varies between about 22°C. and 28°C. *D. S. Bertram*

Hamon, J. Étude biologique et systematique des Culicidae de l'île de la Réunion. [**Biological Study and Systematics of Mosquitoes in Réunion Island**] *Mem. Inst. Sci. Madagascar.* Ser. E. 1953, v. 4, 521–41, 12 figs. [12 refs.]

Twelve species of mosquito were taken in Réunion island by the author: *Anopheles coustani*, *A. gambiae*, *Aëdes dufouri*, *Aëdes aegypti*, *Aëdes*

albopictus, *Aëdes fowleri*, *Culex tigripes*, *C. insignis*, *C. poecilipes*, *C. univittatus*, *C. pipiens fatigans*, and *C. tritaeniorhynchus*. *A. funestus* and *A. squamosus* were not found in 21 months of investigation. Several maps show the distribution of rainfall and of the mosquito species over the island.

Residual insecticide (DDT) has been in use since 1948.

A. gambiae was mainly exophilic, but biting man voraciously outdoors in the evening.

There is evidence that Réunion mosquitoes differ morphologically from specimens of the continental mainland, notably *Culex univittatus* and *C. tritaeniorhynchus* as regards the siphonal index and the number of comb spines. Keys to adults and larvae are illustrated by a few figures for larvae. *D. S. Bertram*

GILLETT, J. D. **Variation in the Hatching-Response of *Aëdes* Eggs (Diptera: Culicidae).** *Bull. Entom. Res.* 1955, Aug., v. 46, Pt. 2, 241–54, 2 figs. [11 refs.]

The following is substantially the author's summary:—

Eggs of *Aëdes* do not necessarily hatch on becoming mature, even though conditions are known to be compatible with hatching. Even the eggs laid by a single female in a single batch, and kept under identical conditions, may hatch erratically over a long period.

The problem of erratic hatching has been studied here mainly in *Aëdes africanus* (Theo.) and *A. aegypti* (L.). It is considered that morphologically mature eggs enter a state of diapause, the depth of which varies with time, the manner of this variation with time itself varying from egg to egg. Different batches of eggs laid by females of the same species vary in the proportion of the different kinds of eggs present.

The variation in response of the eggs has been studied by the application of a suitable hatching stimulus in equal daily doses. [The stimulus was a sudden drop in temperature of about 9°C., or removal of the eggs from water for one minute.] This stimulus was sufficiently weak to allow variation in response to be manifested, but sufficiently strong to outweigh uncontrolled variables in the environment.

Tests were made of certain variables which occur between females and between the eggs laid in a single batch, and which might conceivably influence the hatching response of the eggs: the orientation of the eggs with respect to gravity, small differences in age at the time of submergence, the order of laying within a batch, the number of blood meals taken by the female before oviposition, and the number of matings by the mother before the first blood meal. These factors are shown not to influence the subsequent hatching response. Inconclusive results were obtained about the influence of the amount of some hypothetical substance laid with the eggs by the mother.

It is suggested that variation in the hatching response of *Aëdes* eggs has an inherited basis. *D. M. Minter*

GILLETT, J. D. **The Inherited Basis of Variation in the Hatching-Response of *Aëdes* Eggs (Diptera: Culicidae).** *Bull. Entom. Res.* 1955, Aug., v. 46, Pt. 2, 255–65.

The author in a previous paper [above, p. 253] has shown that the eggs of *Aëdes* may differ very markedly in their response to a moderate hatching stimulus, such as a sudden fall in temperature for a few minutes, or removal of the eggs from water for one minute. In this paper he has sought to demonstrate that this variability of response is due to genetical factors contributed by both parents which influence the hatching behaviour of the subsequent offspring.

A study of two colonies of *Aëdes aegypti*, one originating from West Africa, and the other from East Africa, showed that, in respect of the hatching response, the two strains behaved very differently. When both were exposed under the same conditions to an equal daily dose of a moderate hatching stimulus, it was found that only a very low percentage (0–9 per cent.) of the West African strain responded to the stimulus, while 46–100 per cent. of the East African strain hatched in response to the same stimulus. The next generation from each of these strains produced very similar results, while crosses between the strains resulted in a much wider scatter in the response produced (16–100 per cent. and 4–99 per cent., respectively). Mating experiments also indicated that both male and female parents contribute factors which affect the behaviour of subsequent eggs. The author correlates the differing hatching-behaviour patterns in the two strains used with slight differences in ovipositional habits and general biology in their separate natural environments, and suggests that the observed differences in hatching response reflect the adaptation of a given population to a given environment, and points out that such an inherited difference in behaviour between populations can be a step towards speciation, the actual differences in behaviour between populations thus being determined by isolation and selection. *D. M. Minter*

EDMUNDS, L. R. **Notes on the Biology and Seasonal Abundance of the Larval Stages of *Culex tarsalis* Coquillett in Irrigated Areas of Scotts Bluff County, Nebraska (Diptera: Culicidae).** *Mosquito News.* 1955, Sept., v. 15, No. 3, 157–60, 2 figs.

Culex tarsalis appears to be the most important mosquito concerned in the epidemiology of the virus encephalitides in the western U.S.A. It is abundant and frequently attacks man and is a notorious pest.

From May to October 1953 breeding places within a mile of Mitchell,

Nebraska, were studied. This paper records the relative importance of various habitats and includes observations on seasonal occurrence, relative abundance, rates of development and larval associations.

Seepage areas form in early summer after irrigation begins and water lies about for several weeks. Temporary control would be difficult and costly. Permanent control of *C. tarsalis* in this area involves the elimination of these man-made seepage areas and residual pools in irrigated pastures. *H. S. Leeson*

Thompson, G. A. **An Invasion of the Gulf Coast by Salt-Marsh Mosquitoes.** *Mosquito News.* 1955, Sept., v. 15, No. 3, 164–5.

Komp, W. H. W. **The Breeding of *Haemagogus argyromeris* D. & L. in Saline Water (Diptera, Culicidae).** *Mosquito News.* 1955, Sept., v. 15, No. 3, 179–80.

Rivosecchi, L. Dimorfismo sessuale in *Musca domestica.* [**Sexual Dimorphism in *Musca domestica***] *Rendiconti Istituto Superiore di Sanità.* Rome. 1955, v. 18, Pt. 9, 826–48, 6 figs. on 6 pls. [15 refs.]

The English summary appended to the paper is as follows:—

" The author has made a biometrical analysis of the differences in size between the two sexes in *M. domestica.* 41 characters were examined with this view in 50 males and 50 females. The method of measurement and the criteria followed in the biometrical analysis are explained, and then the differences of form (sexual dimorphism in the strict sense) and coloration, as well as dimensions, are illustrated, neglecting the external genitalia and the pigmentation of the abdominal tergistes. The results of the measurements and the statistical analysis are summarized in four tables. By means of a statistical criterion (index of probability of overlapping and ratio between the averages) it was also possible to arrange the characters in decreasing order of the ' typical ' character of the sexual differences. Two other tables show the characters set out in this order."

Howell, D. E. & Goodhue, L. D. **Fly Repellents.** *Soap.* New York 1955, Oct., v. 31, No. 10, 181, 185–9, 221, 1 fig.

The compounds investigated were: di-n-propyl isocinchomeronate (R-326), 2,3,4,5-bis-(Δ^2-butenylene)-tetrahydrofurfural (R-11) and 2,3,4,5-bis-(Δ^2-butenylene)-tetrahydrofurfuryl alcohol (R-440). Of these substances, R-11 has been shown to be a good repellent for cockroaches (Goodhue and Tissol, *J. Econ. Entom.*, 1952, v. 45, 133). Also, this

compound and R-326 have been found effective in repelling house-flies and apparently not very toxic to mammals (Goodhue and Stansbury, *ibid.*, 1953, v. 46, 982).

The present paper describes laboratory and field tests of these substances as repellents for house-flies, stable-flies and horn-flies. The field tests indicated that the effective life of the repellents could be extended by adding stabilizing compounds. Trials in pigsties showed that residues of R-326 from wettable powder sprays lasted longer than those from kerosene solution. It was observed that R-326 was more effective against house-flies, whereas R-11 and R-440 were more repellent to stable-flies.

Combinations of R-326 with either of the other compounds were more effective than any single sample and the same action was attained by adding the pyrethrum synergist N-octyl bicycloheptene dicarboximide.

J. R. Busvine

Marshall, D. R. K. **The Bioassay and Control of Insecticide-Resistant Flies. Part I. A Review of the Literature on the Chemical Control of Flies in Municipal and Urban Areas.** *Roy. San. Inst. J.* 1955, July, v. 75, No. 7, 489–95. [54 refs.] **Part II. The Investigation and Bioassay of a Resistant Strain of** *M. domestica* **breeding on a Refuse Tip.** *Roy. Soc. for Promotion of Health J.* 1955, Aug., v. 75, No. 8, 633–9, 3 figs. **Part III. The Control of DDT-Resistant Flies with Organo-Phosphorus Insecticides.** *Ibid.*, Sept., No. 9, 741–4, 1 fig.

I. The first paper consists of a review of published information on the control by insecticides of flies breeding in refuse tips.

II. The second paper describes a simple method of measuring resistance, by confining batches of flies in an inverted conical flask, coated with DDT (from an acetone solution). Observations were made on the percentages paralysed after half an hour, 1 hour and 24 hours, both with a normally susceptible laboratory colony and a resistant strain. The latter was derived from a refuse tip at Egham, Surrey, where considerable amounts of DDT and BHC had been used for several years. It was found that the rate of knock-down was not very different in the two strains of flies, but many of the Egham flies had recovered after 24 hours. By using different concentrations of DDT in the flasks, results were obtained from which concentration/mortality regression lines were drawn (the mortality being expressed by angular transforms to correct for normal distribution curvature). A comparison of the two curves indicated that the Egham flies were 58 times as resistant as the normal colony.

Similar tests on *Calliphora erythrocephala* obtained from the Egham tip showed no greater resistance than a laboratory colony of this blue-bottle.

Further tests of the house-flies from Egham, after a year during

which no DDT had been used on the tip, indicated a very slight drop in resistance.

The third paper deals with tests with 3 phosphorus insecticides. By a contact method in which house-flies were exposed to residues on filter paper, concentration/mortality regression lines were obtained for parathion, Diazinon and malathion. Their toxicities to the flies were in the ratios 85:11:1.

Similar tests were made with two DDT-resistant strains, one from the Egham tip and another derived from the same source but selected in the laboratory to a level of × 300 normal resistance. The susceptibility of both these strains to Diazinon was not different from the normal laboratory colony. *J. R. Busvine*

Coher, E. I., Wirth, W. W. & Knutson, H. *Culicoides* **of New England (Diptera: Heleidae).** *Mosquito News.* 1955, Sept., v. 15, No. 3, 153–5.

Gaud, J. Phlébotomes du Maroc. [*Phlebotomus* **Species in Morocco**] *Bull. Inst. Hyg. Maroc.* 1954, v. 14, Nos. 1/2, 91–110, 9 figs. [21 refs.]

This paper analyses the seasonal and geographical distribution of 9 species and varieties of *Phlebotomus* collected in French Morocco between 1947 and 1954; 4,471 specimens were collected and identified. At the end of the paper a key is given for the males and females of the forms encountered in the collection; *Phlebotomus papatasi*, *P. sergenti*, *P. alexandri*, *P. perniciosus*, *P. longicuspis*, *P. ariasi*, *P. minutus* var. *parroti*, *P. fallax*, *P. squamipleuris* var. *dreyfussi*. But the key makes no provision for the species previously recorded from the area by other workers but not encountered by the author in the course of this work (*P. langeroni*, *P. perfiliewi*, *P. antennatus* [= *P. signatipennis*], *P. clydei*, *P. africanus* var. *cherifianus*). The occurrence of such species reported by other workers is briefly outlined in the text.

The geographical distribution of the 9 species and varieties referred to is indicated on a series of outline maps, and the relative frequencies of each in the different geographical zones of the country are summarized in a table, from which it is clear that the species composition of the fauna of each area is quantitatively different. For example, the percentage of *P. papatasi* and of *P. fallax* rises progressively from nil in each case, in the Northern Littoral zone, as one passes south and west over the Atlas region towards the fringes of the Sahara, where the percentages rise to a maximum of 64 per cent. and 15 per cent. respectively. In the case of other species the reverse is broadly true, each zone thus having different species predominating in the catches.

The seasonal incidence of species from representative localities in the main geographical zones is tabulated for easy reference, but is not amenable to brief summary here. *D. M. Minter*

León, L. A. & Andrade, M. Caso de miasis ocular a Oestrus ovis observado en Quito. [**Case of Ocular Myiasis due to *Oestrus ovis* in Quito, Ecuador**] *Bol. Laboratorio Clínica "Luis Razetti"*. Caracas. 1955, Apr., v. 16, Nos. 43–44, 621–33, 5 figs. [18 refs.]

Ragab, H. A. A. & Samuel, S. **Human Infection with Linguatula in Egypt (First Case recorded).** *J. Egyptian Med. Ass.* 1955, v. 38, No. 4, 229–31, 2 figs. on pl.

Smith, J. N. **Detoxication Mechanisms in Insects.** *Biol. Reviews*. 1955, Nov., v. 30, No. 4, 455–75. [Numerous refs.]

MISCELLANEOUS PAPERS

Galliard, H., Deschiens, R., Floch, H. & Litalien, F. Étude comparée du test de Thorn à l'A.C.T.H. chez des sujets de race mélanoderme et de race leucoderme. [**Comparative Study of the Thorn Test in Members of Dark- and Light-Skinned Races**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 3, 377–84. [10 refs.]

A hyper-eosinophilia is more readily affected by the administration of corticotrophin (Thorn's Test) to subjects of the white races than to those of the dark races. There is some published work which may have some bearing on this. The present authors have re-examined the matter, in a group of 34 adult and juvenile Africans and 20 similar Europeans. They give the details of their experiments in a series of tables, and confirm that a racial factor does in fact enter into the interpretation of the Thorn test. *A. R. D. Adams*

Bergman, R. A. M. & The Tiong Hoo. **The Length of the Body and Long Bones of the Javanese.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Sept., v. 7, No. 3, 197–214, 15 figs. [Numerous refs.]

REPORTS AND SURVEYS

Maroc: Rapports Sur Le Fonctionnement de L'Institut Pasteur du Maroc, Années 1952–1953–1954. Premier rapport. Fonctionnement des services construction. [**Report of the Pasteur Institute of Morocco for the Years 1952, 1953, 1954**] 57 pp. 10 figs. (7 on 7 pls.).

This Report brings together, for the routine services only, the details of the examinations carried out and the services provided by the various departments of the Institute during the years 1952 to 1954 inclusive.

It is noted that the numbers of persons treated for rabies at Casablanca (with deaths in brackets) in each of the 3 years were 1,637 (4), 1,590 (6) and 1,253 (4). The corresponding figures for the branch institute at Oujda were 265 (1), 266 (0) and 201 (1).

The details of the anti-rabies service are presented in the usual standard form. Figures are given for the doses of smallpox vaccine delivered, which average between 2 and 3 million yearly, and of various other vaccines, sera and biological products.

Detailed figures are also given for the general laboratory examinations performed, but without totals.

A short section, illustrated with photographs and sketch plans, describes the new buildings constructed as annexes to the rabies department in 1953 and 1954. *H. J. O'D. Burke-Gaffney*

Roberto, G. Los problemas medicos de la Isla de Pascua. [**The Medical Problems of Easter Island**] *Rev. Med. de Valparaiso.* 1954, Sept., v. 7, No. 3, 302–9.

This little island, nearly 1,900 miles to the west of Caldera on the coast of Chile, has an area of about 69 square miles. It was annexed by Chile in 1888. The population does not exceed 800. The chief sanitary problem of the island is leprosy, which is supposed to have been brought by Polynesians, originally from China. In 1952 there were 34 leprosy patients (12 women and 22 men), 27 of whom were between 20 and 30 years of age. There is a leprosy hospital with 3 wards and 20 beds, and the condition of the patients is now very much better than it was 20 years ago. There are now 14 in the hospital, 21 on ambulatory treatment with DDS, and 17 under observation. There is no word of syphilis in the reports. Tuberculosis has not been introduced, and it is suggested that the inhabitants should be protected by BCG vaccination. Virus epidemics are often spread rapidly after the arrival of ships, the infection returning to the crew with increased virulence after spreading through the inhabitants. *Ernest Muir*

BOOK REVIEWS

Mozley, Alan [D.Sc., Ph.D., F.R.S.E.]. **Sites of Infection. Unstable Areas as Sources of Parasitic Diseases: Schistosomiasis and Fascioliasis.** pp. x + 86, 14 figs. 1955. London: H. K. Lewis & Co. Ltd., 136, Gower Street, W.C.1. [9s.]

The subject of this book is the ecology of the snail vectors of schistosomiasis and fascioliasis. The author contends that some animals, including these snails, thrive better where conditions are constantly changing as in the unstable areas between adjoining communities. Communities change with a changing environment until relatively stable climax conditions are reached, when they become stabilized. In the marginal areas of ecotones between communities these changes occur rapidly and there is little stability. *Lymnaea truncatula* is an example of an animal living in the ecotone between land and water. In addition to ecotones, unstable conditions are found in areas which are subject to seasonal or cyclical changes or to human interference. Where marked seasonal changes in vegetation occur, animals dependent on it for food increase and decrease with great rapidity, and conditions may be regarded as perennially unstable. In such situations only a few species tend to exist and they may be highly prolific because normal competitors are absent. The range of a vector may be increased if unstable conditions extend, and even at their extreme range, though colonies may be scanty, they may be very dense. The author believes that where an aquatic snail becomes firmly established in a site it may increase and become dominant, and hence he suggests the introduction of harmless snail species which should consume the food supply of vector species and may supplant them. As an alternative, organic matter may be excluded from the water in order to reduce the food supply, or the vegetation may be controlled by chemical or other means so that snail infestations may be reduced or prevented. The longest chapter is concerned with a description of the common habitats of schistosome or liver-fluke vectors. The author makes the plea that some natural snail habitats should be allowed to proceed to biological stabilization so that the snails will disappear; in irrigation canals instability is essential to proper functioning and only molluscicides will be effective as a control measure. He relies on copper alone and has " refused to be led into uncritical enthusiasm " for more recent synthetic molluscicides.

The reviewer found this book difficult to understand. The theme linking the various chapters was not easy to detect and some of the writing was so obscure as to be unintelligible. The book is intended for those who know little about the ecology of the vectors of schistosomiasis and fascioliasis, but it is unlikely to be of use to them and will not help those who know something of the subject. It is well produced and contains some good illustrations.

T. H. Davey

Carpenter, Stanley J. & LaCasse, Walter J. **Mosquitoes of North America (North of Mexico).** pp. vii + 360, 288 figs. & 127 pls. 1955. Berkeley & Los Angeles: University of California Press. London: Cambridge University Press, Bentley House, 200, Euston Road, N.W.1. [75s.]

Eighteen years' intensive study of the mosquitoes of North America have gone into the production of this work. It starts with an illustrated account in general terms of the life history of the mosquito and then describes methods of collecting adults and aquatic stages. Notes on the preparation of material for study are given, and here the reader may be interested to observe that of all the mountants which the authors mention they still prefer to use Canada balsam. An illustrated account follows of the external anatomy of adults, pupae, larvae and eggs and of the internal anatomy of the female.

The main part of the work, some 300 pages, is printed in double columns and consists of descriptions of the females, males and larvae of 143 species and subspecies of mosquitoes which have been recorded in America, north of Mexico, including all the necessary keys for their identification; classification follows closely that of Edwards. Appended to each description are notes on general geographical distribution and the published references to states and provinces of the U.S.A., Canada and Alaska; but no maps. Summaries of the bionomics of the species are also given and, where appropriate, comments on medical importance.

Of the 14 species of *Anopheles* listed as occurring in this region 3, *freeborni*, *pseudopunctipennis* and *quadrimaculatus* are noted as important vectors of malaria, *crucians* as a species to be watched and others as having been infected in the laboratory. Other mosquitoes of this territory which are mentioned as vectors of disease organisms include *Culex pipiens* and *C. quinquefasciatus* [*C. fatigans*], transmitters of bird malaria and *Wuchereria bancrofti*; *C. pipiens* is also concerned in the transmission of *Dirofilaria immitis* to dogs. *Psorophora ferox* is known from several localities and is the mosquito which is found carrying the eggs of *Dermatobia* in Colombia and Panama. *Aëdes aegypti*, the vector of yellow fever and dengue, is also in the list. *Culex tarsalis* is believed to be the chief vector of the virus of Western equine encephalitis under natural conditions and the viruses of both St. Louis and Californian encephalitis have also been isolated from this species. Other mosquitoes associated with the different encephalitis viruses are *Culiseta incidens*, *C. inornata*, *C. melanura*, *Aëdes dorsalis*, *Mansonia titillans*, *M. perturbans*, *Culex pipiens* and *C. quinquefasciatus* [*C. fatigans*]. In addition, many of the mosquitoes in North America, especially those *Aëdes* of the subgenus *Ochlerotatus*, are such persistent biters that they are serious pests, often attacking by day as well as by night, in woodlands or in marshy country.

A striking feature of the book is the quality of the illustrations.

Accompanying the text are clear line drawings of male terminalia and larval anatomy, while at the end of the work 127 complete females are shown in careful detail in black and white, each one on a full page plate. The bibliography contains 770 entries on more than 20 pages and the 3-column systematic index occupies 6 pages. There is, however, no index to place names, and no list of mosquitoes occurring in one state or province. If one wishes to know the species of mosquitoes occurring, say, in Labrador, one has to go through them all.

On the paper jacket this book is claimed to be " a definitive work on the taxonomy, biology, geographical distribution, and medical importance of mosquitoes in America north of Mexico. It is designed to meet the needs of technicians, systematic entomologists, public health officers, and field workers engaged in mosquito control ". It is certainly a most useful entomological work, and it may well be used as a reference book by the various people mentioned above who need to know something of the mosquitoes of this part of the world; but they must not expect to find a section on mosquito control, as this subject is obviously outside the authors' intention. They have endeavoured to bring together scattered knowledge about these mosquitoes and to present it in a concise and up-to-date account, and this they have succeeded in doing.

H. S. Leeson

Dey, N.C. [B.Sc., M.B.B.S., D.Bact.] **Medical Parasitology.** 166 pp., 4 coloured pls. & 58 figs. 1955. Calcutta 12: U.N. Dhur & Sons Ltd., (Distributors), 15, Bankim Chatterjee Street. [Rs.12/8/-.]

In his preface the author states that the excellent textbooks on medical parasitology at present available are beyond the scope of the average undergraduate whose course of study is necessarily strenuous. This volume is an attempt to provide the essentials of the subject in small compass. After an introductory chapter of 3 pages, protozoology is dealt with in 50 pages, helminthology in 72 and entomology in 13; there are two appendices, occupying 15 pages, dealing with techniques for the examination of specimens.

The section on protozoology covers the ground systematically though briefly. Incorrect information is given on several occasions. For example, it is stated that *Trypanosoma gambiense* and *T. rhodesiense* are morphologically similar except that the macro-nucleus of the latter is more posteriorly situated than that of the former; that antelope and crocodiles are reservoir hosts of sleeping sickness; while in the illustration of the life-cycle of *T. gambiense* an antelope is figured as a host. Among the trypanosomes affecting animals there is no reference to *T. vivax* or *T. congolense*. Sixteen pages are allocated to malaria. The tissue phases of the malaria parasite are described briefly but incompletely, and in the accompanying plate (Plate III) the exo-erythrocytic cycle is shown as originating from circulating merozoites of the asexual cycle. In classifying

the degrees of malarial endemicity according to the spleen indices it is regrettable that there is no reference to holo-endemic malaria.

The helminthology section also contains a number of inaccuracies. The eggs of *Diphyllobothrium latum* are stated to be covered with cilia (p. 60) though in the detailed description it is correctly stated that the embryo is ciliated. The mature segments of *Hymenolepis nana* are said to be 0·3 mm. long by 0·09 to 0·15 mm. broad, but the illustration shows them correctly as much broader than long. The dimensions of *Schistosoma mansoni* adult males are given as 1 to 1·2 mm. by 1 mm., clearly a misprint for 10 to 12 mm. by 1 mm. Elephantiasis due to *Wuchereria bancrofti* is said to be usually due to the " non-periodic variety of microfilaria ".

The section on entomology is the least satisfactory of the three. The arthropods of medical importance are dealt with in insufficient detail to enable the student to identify the genus. The brief descriptions and life histories could appropriately have been included in the sections dealing with the parasites carried by these vectors. At times technical terms are used without definition. Some incorrect statements are again included, *e.g.*, that immature lice grow to be adult in 3 months and that epidemic typhus is spread by the bite of the louse as well as its excreta. *Ornithodorus moubata* is stated to be an important vector of tick-borne relapsing fever in America.

The first appendix deals with the examination of blood for malaria and kala azar and the second with the examination of stools for *Entamoeba histolytica* and helminth ova. There are four colour plates which are moderately good and numerous line illustrations, many of which are crude and do not accurately portray their subject. The spirochaetes are not described though they are mentioned.

Among the good features of the book are a number of tables comparing parasites with one another or differentiating their developmental stages. Much of the writing is careless, there is much unnecessary repetition and misprints are very numerous. In this review many of the more serious mistakes have been pointed out so that in the event of a further edition they may be corrected. This handbook would then be of value to students and practitioners in India, though it would be of little value to those in other parts of the world owing to the small space given to parasites which are less common or absent from that country. *T. H. Davey.*

Adams, A. R. D. & Maegraith, B. G. **Tropical Medicine for Nurses.** pp. vii + 314, coloured frontispiece & 34 figs. 1955. Oxford: Blackwell Scientific Publications, 24–25, Bond Street. [30s.]

The shortage of medical manpower in the tropics, imposing as it does an extra demand on the care and skill of nurses, makes a book of this kind especially valuable. The book is not one on nursing; its aim is to impart sound information on the prevalent tropical diseases and on how

to deal with them. The charge of endeavouring to make good nurses into inferior doctors is accepted and the policy of doing so justified by the special circumstances existing in the tropics. Whether this policy is sound or not, nothing but good can come from nurses having as full a knowledge as possible of the principles upon which their practice is based. Hitherto there has been no modern work with this aim in so far as tropical medicine is concerned.

A comprehensive range of subjects is dealt with and uncommon conditions are not neglected. Throughout, descriptions of aetiology, pathology, the clinical picture and treatment, are interspersed with practical information of great value and with recommendations which will enable the nurse to collect the data most required by the doctor. This practical information is amplified by a useful appendix containing instructions for staining blood films, examining urine and stools, and preparing specimens for transmission to laboratories. The style is lucid, there are many excellent illustrations and remarkably few typographical errors. The book is up to date and many at present nursing in the tropics and who trained some years ago will welcome it as an excellent refresher course; all who are preparing to go to warm climates to nurse should be fully familiar with its contents. It can be recommended without hesitation.

A. W. Woodruff.

VAUCEL, M. **Médecine tropicale.** Mise à jour de la collection médico-chirurgicale 1955. Loose-leaf pp., illustrated. Paris VI^{e}: Éditions Médicales Flammarion, 22, rue de Vaugirard. [Fr. 625.]

Médecine tropicale has already been reviewed in this *Bulletin* [1953, v. 50, 587]. The book is published in loose-leaf form so that revision pages may be added as the need for them arises. These now issued by the authors relate to paragonimiasis, leishmaniasis, spirillosis, pinta, dengue, trachoma, rickettsial diseases, bartonellosis, cholera, melioidosis, *Salmonella* infections, several fungus diseases, pellagra, tropical eosinophilia and venoms.

These pages will add to the already considerable value of the original two volumes.

John Rathborn.

Printed in Great Britain under the authority of HER MAJESTY'S STATIONERY OFFICE
by The Eastern Press, Ltd., London and Reading.

(1989) Wt. P8525/461 2/55 E.P. Ltd. Gp. 566.